RIG™

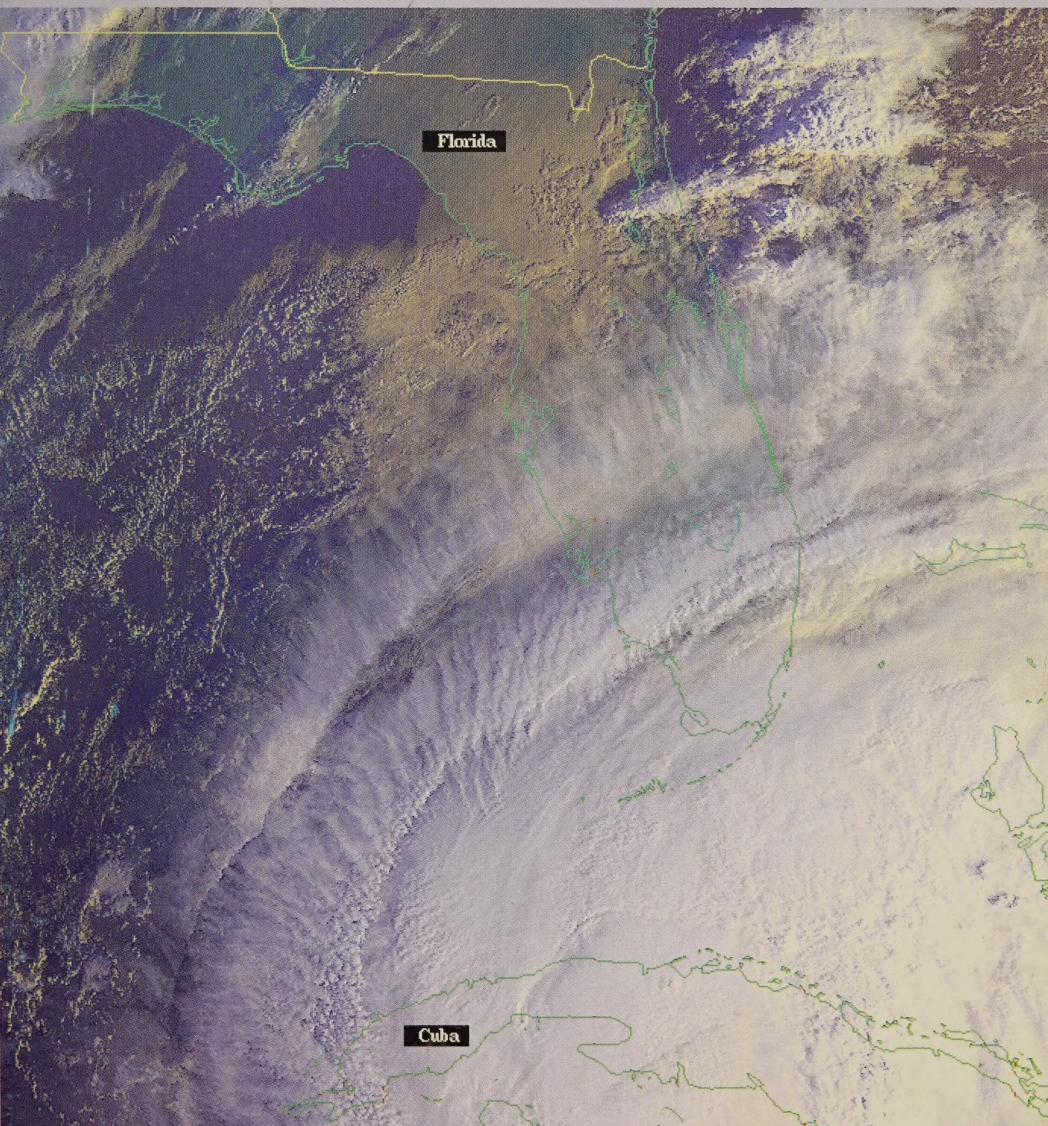
Remote Imaging Group

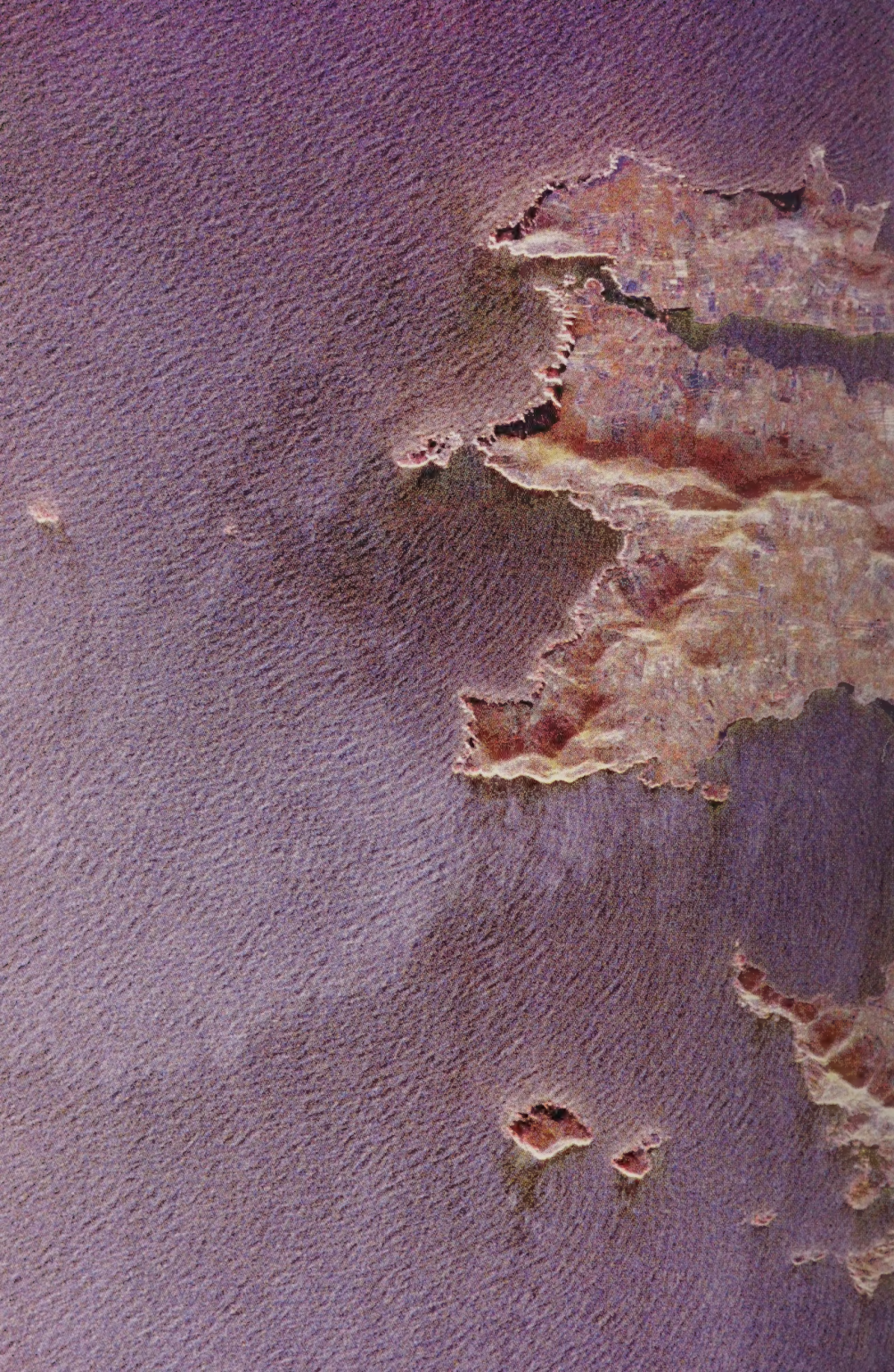
JOURNAL

Issue Number

47

December '96





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Published by The Remote Imaging Group (RIG). VAT Registration No. 594 7483 83
Printed by The Fairway Press Limited. Reading.

CHAIRMAN'S REPORT

FRANK BELL

Whatever the formula is for attracting membership to RIG and the benefits that members enjoy, it is a successful combination. Membership is at a record level with a prediction for about 2250 members by the end of 1996. In the journal the mix of articles, construction projects, the meteorological series, advertisements and club news seems to meet the needs and interests of most members. It is a tribute to the journal editor, Peter Wakelin and make up by Mark Pepper that the journal is produced to such a high professional standard. Our friends at EUMETSAT have asked to receive extra copies of the journal for use in their own programmes, high praise indeed.

However, along with the success of RIG in terms of numbers of members come problems. The sheer scale of our group puts a strain on your committee. With about twice as many members now as we had five years ago, comes twice as much work in serving the increased membership. Unless there can be a shedding of responsibilities to new people I feel that it will not be possible to sustain the present range and quality of services from the existing committee.

An indication of the strain that your committee feel was our inability to attend and service a stand at the last Leicester radio rally. We had published the fact that we would be there and I apologise to those members who attended the rally in the expectation of seeing us there. RIG usually attract new members at the Leicester rally as well as a number of existing members renewing membership. In early 1997 there will be the VHF rally at Sandown and Pickett's Lock rally. If we have members who are will to help at these and other rallies please get in touch with a committee member.

A case study of the strain we feel is the workload born in the past by our treasurer, Mark Clark. Mark's work has now been reduced by paying for professional help. Unfortunately there are other areas of our group where the strain of maintaining services is also showing.

There is currently a major issue about club sales. My feeling is that this job should be done by one person who has no other specific responsibility. To expect club sales to be added to a willing member's other contributions is beyond the call of duty. Specifically we are looking for one person to take over the responsibility for club sales. This will involve receiving orders, collecting payments and dispatching the goods. It is a job which will require regular attention but does not necessarily need a high level of technical skill. Ideally, this is a job for a member but with a suitable

inducement a co-operative spouse could perform the role. The urgency is this; the name and address of the person or organisation handling club sales must be published in the next journal, otherwise sales may cease. The location from which club sales is operated does not matter; all that is needed is access to a Post Office. Volunteers to look after club sales please contact any committee member.

Looking to the medium term time scale I think there must be changes. It is not reasonable to expect an increasing membership to continue to be supported by the rather small existing committee. Not only does the workload need to be more widely distributed but it is also healthy that there should be a regular rotation of people and responsibilities. No matter how excellently a job is done, new people bring enthusiasm and a new perspective to a task. This is what RIG now needs.

The message must be clear and unambiguous to a RIG membership of 2250; more involvement is needed; workloads have to be dispersed to keep the style of RIG as it has been in the past.

In spite of the above reservations and our interrogative future, RIG has a grand, glorious and perhaps even a prestigious present. Let's keep it that way. Over to you, the members. ⊕

1996 ANTARCTIC OZONE HOLE

Substantial depletion of ozone over Antarctica during the southern Spring has once again been detected. This year's 'ozone hole' was, on average, slightly smaller than the peak size measured in 1993 and the lowest ozone values were higher than the record lows seen in September 1994.

Two satellites launched in 1996 carried NASA's Total Ozone Mapping Spectrometer (TOMS) instruments. One was on board NASA's Earth Probe satellite launched in July and the other was on the Japanese Advanced Earth-Observing Satellite (ADEOS) launched in August.

The first TOMS was on board Nimbus 7 and measured ozone levels between November 1978 and May 1993. The seasonal depletion of ozone over Antarctica was first detected by this spacecraft in 1985. Another TOMS was launched aboard Meteor 3-5 in 1991.

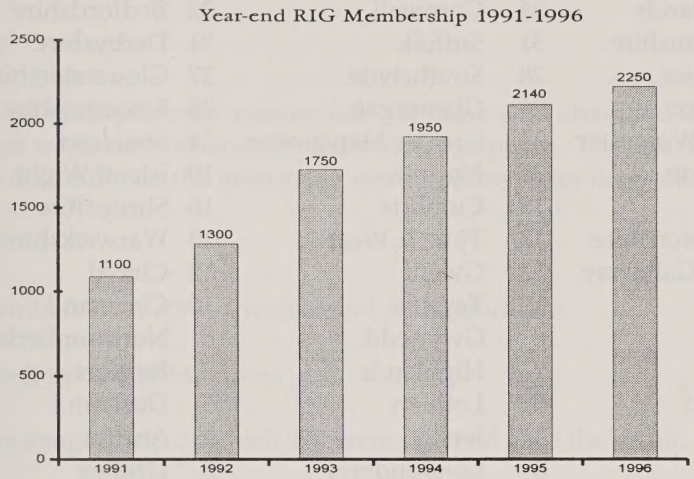
Data from ADEOS TOMS is shown on the back cover of this issue. Ozone values of around 100 Dobson units over Antarctica are only about one-third of the global average values. The Dobson unit is related to the thickness the ozone layer would have if the ozone alone was brought down to standard sea level pressure at 15C. 100 Dobson units is equivalent to 1mm. ⊕

MEMBERSHIP SECRETARY'S REPORT FOR 1996

Ray Godden, G4GCE

Headlines

- Membership continues to increase but at a slower rate.
- Renewal rate is maintained at 85%.
- Overseas membership has levelled off at 20%.



Overseas Membership:

Sweden	51	The Netherlands	41	United States	41
Ireland	38	Australia	31	Germany	26
Belgium	24	Italy	20	New Zealand	20
France	20	Spain	15	Denmark	12
Norway	12	Arab Emirates	6	Luxembourg	6
South Africa	6	Switzerland	6	Finland	5
Greece	5	Japan	5	Malta	5
Austria	5	Canada	4	Mauritius	4
West Indies	5	Oman	3	Zimbabwe	3
Falkland Islands	2	Hong Kong	2	Iceland	2
Portugal	2	Russia	2	Botswana	1
Brazil	1	Israel	1	Kenya	1
Poland	1	Reunion Island	1	Samoa	1
Thailand	1				

We now have members in 41 countries compared to 44 in 1995. Sweden remains in the lead followed by the USA, The Netherlands and Ireland.

UK membership by county:

Yorkshire	74	Hampshire	70	Greater London	68
Surrey	67	Sussex	65	Essex	63
Kent	59	Devon	56	Hertfordshire	49
Avon	48	Dorset	41	Lincolnshire	39
Cambridgeshire	38	Cheshire	37	Lancashire	37
Buckinghamshire	36	Berkshire	35	Merseyside	34
West Midlands	34	Cornwall	32	Bedfordshire	31
Nottinghamshire	31	Suffolk	31	Derbyshire	29
Staffordshire	28	Strathclyde	27	Gloucestershire	26
Oxfordshire	26	Glamorgan	25	Leicestershire	25
Hereford/Worcester	24	Greater Manchester	24	Somerset	23
Humberside	21	Norfolk	19	Isle of Wight	18
Wiltshire	18	Cumbria	16	Shropshire	15
Northamptonshire	13	Tyne & Wear	13	Warwickshire	13
Dumfries/Galloway	12	Gwent	12	Clwyd	10
Dyfed	10	Tayside	10	Cleveland	8
Grampian	8	Gwynedd	8	Northumberland	8
Central	7	Highlands	7	Borders	5
Isle of Man	5	Lothian	5	Durham	4
Fife	4	Jersey	4	Antrim	3
Down	3	Londonderry	3	Orkney	3
Tyrone	3	Powys	2	Shetland	2
Fermanagh	1	Guernsey	1	Western Isles	1

Licensed Amateurs

Members with a call sign 1278, 60% (1230, 60%). The percentage figure is remarkably constant.

The 1996 Activity Survey

Unfortunately, in spite of our best efforts, the printers re-arranged the pages which made up the renewal form and activity survey. This was a bit irritating; one effect was that the credit card details were on one side and the name and address on the other. In a few cases I had only the card details! However, in all but one case the member was traced by other evidence.

Approximately 900 members completed at least part of the survey. In all cases 1995 figures in brackets.

Receiving

Polar orbiters: APT - 1,420 (1,321) HRPT - 78 (65)

Geostationary: APT - 813 (758) PDUS - 63 (64)

Generally there has been an increase in line with rising membership, the exception being a decline in PDUS reception possibly due to the implementation of encryption.

Interference

454 (375) members experience interference. Of those who identified the source 304 blamed pager transmissions and 119 their own computer. The is a disappointing increase, no doubt due to the inexorable spread of the pager network.

Education

230 (220) members have some involvement with education.

Help/Advice from Other Members

178 members sought help of which 170 were satisfied with the result.

One of the benefits of membership is the availability of assistance from those with experience - particularly for beginners. The above indicates that in the great majority of cases this help is forthcoming and nobody should feel inhibited about asking for it. RIG members are a friendly crowd and only too pleased to show off a little!

Principal Interest

Radio technology 373. Meteorology 419. Observation of the earth 521. Computing 267.

The response to this question was not quite what I intended. I expected only a single check, in most cases several boxes were checked - 64 members selected *all* the topics. However, perhaps the result illustrates the fact that this hobby satisfies a number of interests rather than one in particular.

Journal Topics More/Less

The majority view was that content is fine as it is - a common remark was "Don't change anything"! Inevitably, few asked for less of anything. The most popular desire was for more constructional articles (110 members) followed by more meteor-

ology (38), 'tehnical' (36) and topics for beginners (27). The one topic where those wanting more (6), were outnumbered by those wanting less (9), was computing and software. Many other topics were mentioned by small numbers of members or individuals - a beginners' page, satellite systems and platforms other than NOAA, Meteosat etc. and some want to know how to receive and decode space probes and military 'spy' satellites. Anybody with the requisite know-how is invited to contribute an article.

RIG Rating

Poor 0. Not Very Good 1. OK 44. Very Good 395. Excellent 442.

Averaging the result, you regard RIG as almost exactly mid-way between very good and excellent. There was not a single poor rating but, of course, anyone who was so dissatisfied would not be likely to renew. Even so this is a remarkably high and encouraging rating.

Comments

Below is a random selection of your comments. No attempt has been made to categorise or weight them as they cover a wide range of issues.

I think you have a good balance! Very nice publication - excellent layout, photos, printing.
Some more information on what is happening in the professional world of remote sensing.
At least one short event somewhere in the North of England.
How about including sun outage times in the spring and autumn for geostationary sats.
A4 or A5 - monthly. (A number of members expressed preferences for A4 or A5 format but opinion was evenly balanced.)
Excellent, pocketable journal. Articles linking sat. observations with long term weather analysis are very interesting (El Nino etc.).
Please keep up the good work of an excellent organisation. Thanks to all who put in such hard work.
Image Processing for dummies?
I would like to see more projects with all/or some components like the RX1.
Again a superb issue of the Journal. It is a pleasure to receive it and read it from cover to cover at least twice!
Some really first class articles have appeared in RIG over the past year, keep it up!
It must be the best value for money journal in the world!
The whole organisation appears to be in harmony and in touch with all aspects of remote imaging.

Too many (by my standards!!) pricey, off the shelf items eg RXs, A/D converters etc. -would like to see more home-brew if possible for the less well off.
The apparent feeling that RIG is in the SE of England is strange, and discussion, for example, of attendance at rallies, is pointless for many.
A number of articles describe what to do but not how.
Peter's series of articles on interpreting our images was so excellent that I bought all the back numbers needed to have all the instalments.
Reviews of software and equipment do suggest undue flattery and might perhaps show where criticism is needed.
Don't forget to explain what something is used for, not just how it works!
Would prefer A4 size but the printing/paper/presentation excellent.
Please publish more pictures from outside the UK.
(Less of) Members' chattering rubbish.
You have it just right.
Blatant links with makers of systems should be A/ Dropped or B/ Fully publicised.
Membership of RIG and the Journal is the best use I make of £10 all year.
A series of articles on how to interpret WEFAX IR - visible images for fronts, cloud height, type, etc.
I would like to see a permanent question and answer section to assist the not so technical members.
Imaging technologies.
RIG is wonderful!
Nice to see RIGstuff on WWW.
The quality and content of the Journal are outstanding.
Would like to see more home-construction articles... a bought receiver plugged into a PC means brain dead observer in my book.
I attend a lot of conferences in astronomy but last RIG conference was really impressive - the quality of the speakers was by far the best I have ever seen.
More issues per year.

Comments on Comments

As you see many comments are complimentary - but not all. They are welcome, including the negative ones that prevent the Committee becoming too self satisfied and complacent. Please keep them coming.

Finally

My thanks to all those who included Christmas cards, postcards and other tokens of good wishes. Compliments of the season to you all. ⊕

FILL UP AND RETURN YOUR RENEWAL/SURVEY FORM NOW!

A SYNTHESISED LOCAL OSCILLATOR FOR 137 MHz RECEIVERS UTILISING MICROPROCESSOR CONTROL

John Cooper, G8GKU

This article is offered to those RIG members who have a 137MHz non-synthesised receiver. Such a receiver will most likely have a local oscillator running near 126MHz. A receiver kit sold by Maplin, now some years old, has a free-running oscillator at 126MHz and is typical of the style of receiver to which this synthesiser may be applied. The early Cirkit receiver and the RIG RX1 may be suitable candidates.

Throughout the design process for this synthesiser and related circuits the main aim has been to achieve a high degree of functionality together with a very simple-to-operate user interface, all at low cost. The synthesiser is intended to be computer controlled and software will be presented to support this process. This article describes the following:

Frequency synthesiser based upon Plessey products.
Micro-processor (PIC) based controller for the synthesiser.
Replacement local oscillator, if needed.
A power supply circuit if required.
Optional 7-segment display to indicate channel.
PCB artwork for the above units; see appendices A and B.
Software as needed to control the synthesiser (available on floppy disk).

The PIC software is given free as shareware but remains the copyright of the author. Before etching any of the printed circuit boards, you are advised to read appendices A and B. As the APT band is close to the 2 metre amateur band, the project, as described, lends itself to conversion for 2m reception. The main change is in the PIC programme.

GENERAL COMMENTS

If you are an experimenting sort of person then you may already have ventured into the technicalities of frequency synthesis. There are several techniques available; the technique used here is the well tried and popular method involving counters and phase locked loop (PLL) technology. Plessey has produced an excellent range of fully engineered high speed digital counters, dividers and associated PLL systems. Two of their products are used in this synthesiser.

It is not intended to write here more than the minimum needed to enable readers to assemble, test and use the synthesiser. References are provided for more detailed research.

THE BLOCK DIAGRAM

Starting at the left hand side of the system block diagram (Fig 1), you will see the section titled 'user controls'. Four press button switches are arranged to give +5V to a specific input pin on the PIC when the corresponding button is pressed.

The main part of the system is the PIC processor unit, the task of which is to act upon commands presented via the user interface switches. When power is first applied the PIC loads the synthesiser with the binary corresponding to the correct local oscillator frequency for 137.5MHz. Next, the PIC, under software control, scans the switches until an input command is found. Four such commands are provided; step channel up or down, together with scan start and scan end. Not shown on the block diagram is a reset switch which, if necessary, restarts the programme. In the prototypes the reset switch has not been used; the PIC has power-on reset circuitry which works very well.

Hardware on the PIC board allows an external input to end the scan in addition to the press button. This additional facility allows the operator to interface a tone detector set to 2.4kHz, causing scan stop upon detection of the APT audio carrier.

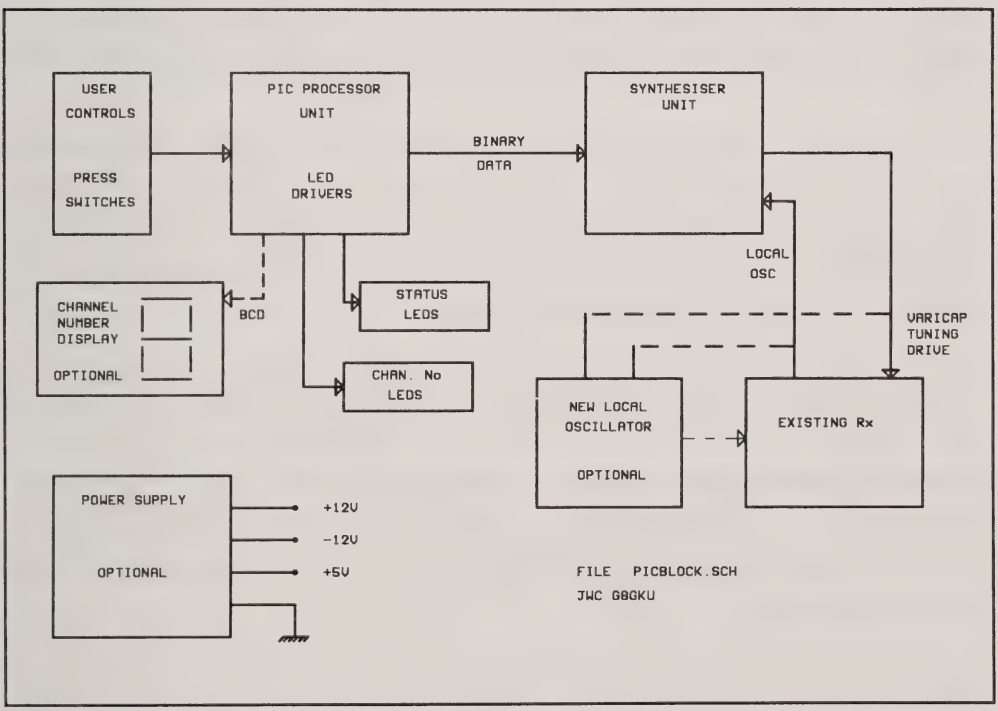


Fig 1. Block Diagram

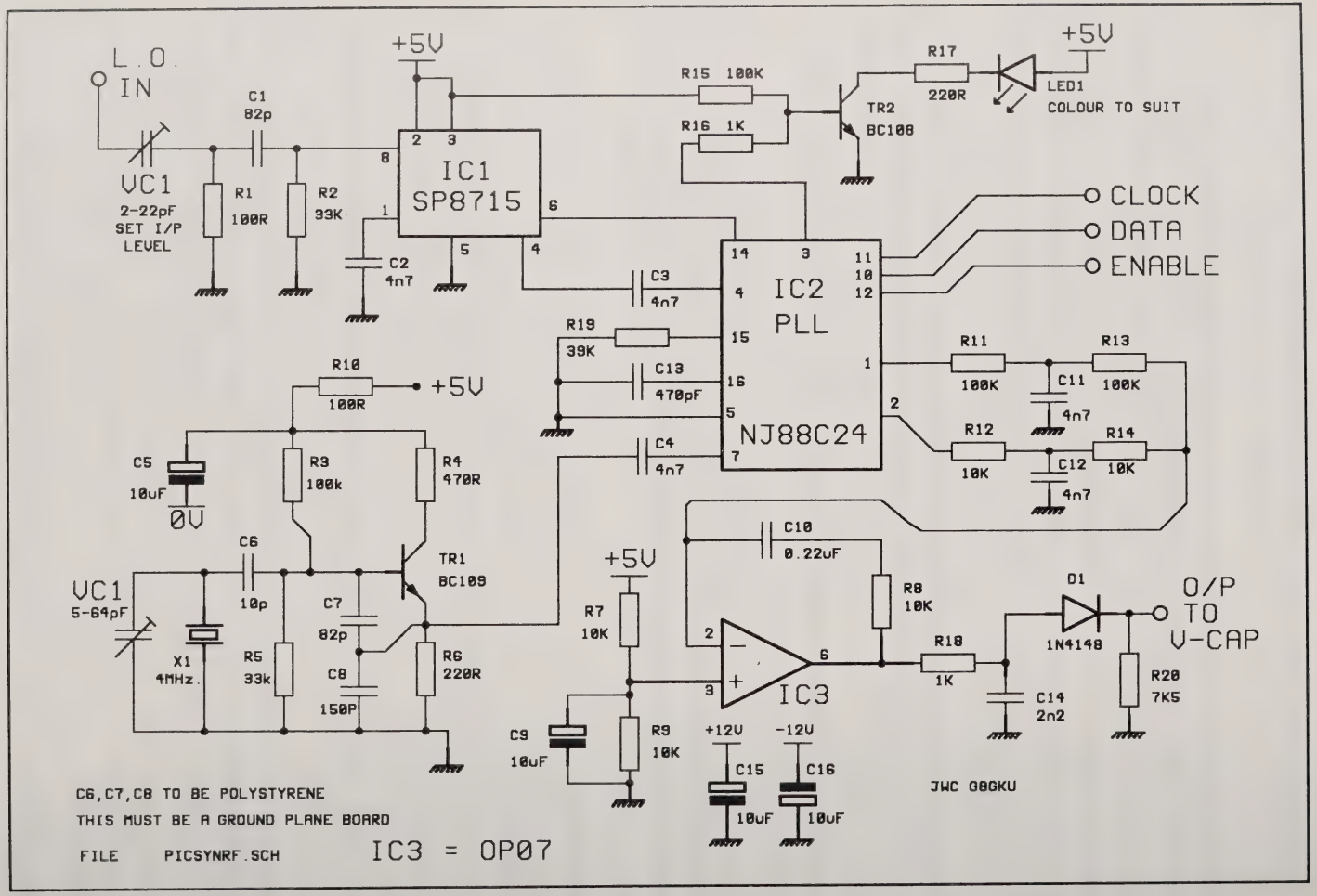


Fig 2. Synthesiser RF Unit.

soldering iron which has been at working temperature for some time. Unplug it from the mains just before you solder these ICs and, as an additional precaution, make a temporary wire link from the soldering iron tip to the zero volts line of the boards with a small crocodile clip to reduce the risk of damage due to static discharge.

Controller Board

Assemble the PIC controller board (Fig 6a) using the same general technique as for the RF board. *It is sensible to use a socket for the PIC device.* This board carries the 16C55

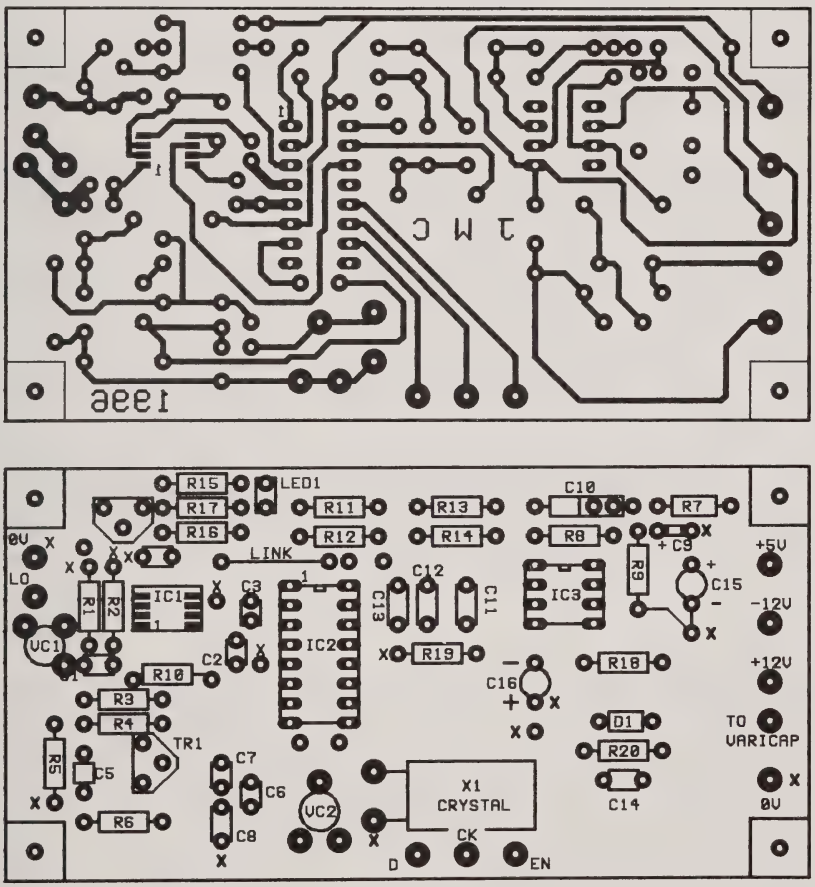
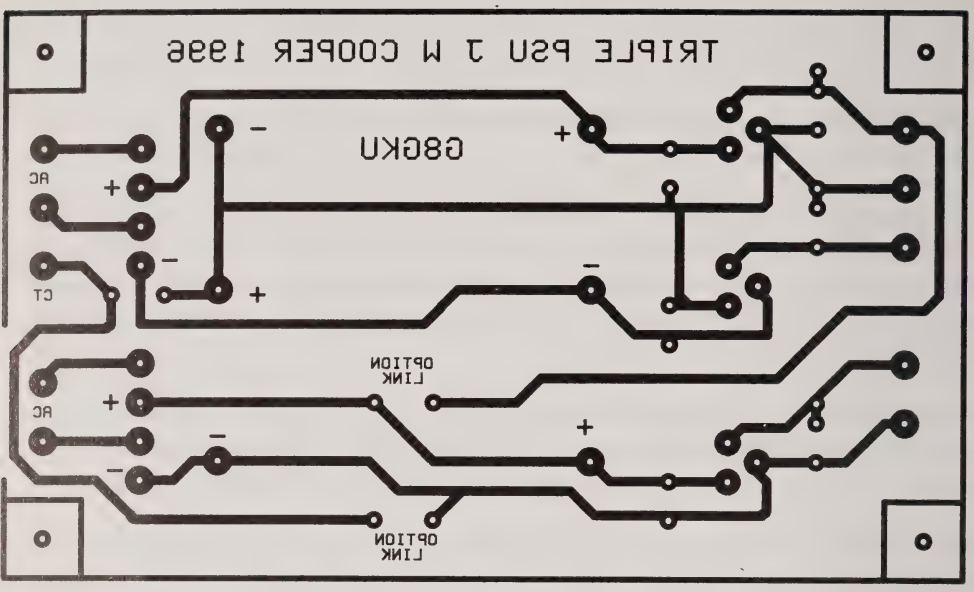
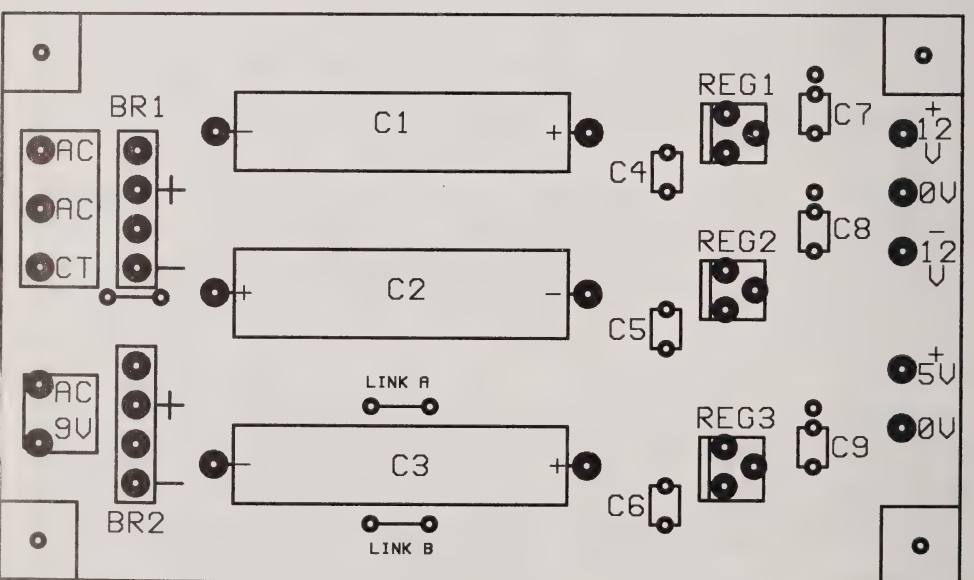


Fig 2a. RF unit PCB and parts placement.





PARTS PLACEMENT TRIPLE PSU

Fig 3a. PSU unit PCB and parts placement.

and extracting a low-level LO signal (100mV is sufficient). If the power supply is a cause for concern a PCB layout is given (Fig 3a) which will accept standard regulators, eg 7805, 7812 and 7912.

Readers wishing to convert receivers constructed from Maplin kits will find that the original design already has a buffered LO take-off waiting to be used. Those readers wishing to convert a receiver without an existing LO take-off may wish to do one of three things:

1) Take a chance and connect the synthesiser directly to their LO via, say, a 5pF capacitor.
2) Make and fit a small buffer amplifier to their existing LO.
3) Build the new LO described in this article.

Note that the varicap tuning voltage is intended for a 'normal' varicap circuit in which a positive increase of varicap voltage produces an increase in frequency of the LO. If this is *not* the case in your receiver then either an op-amp circuit may be

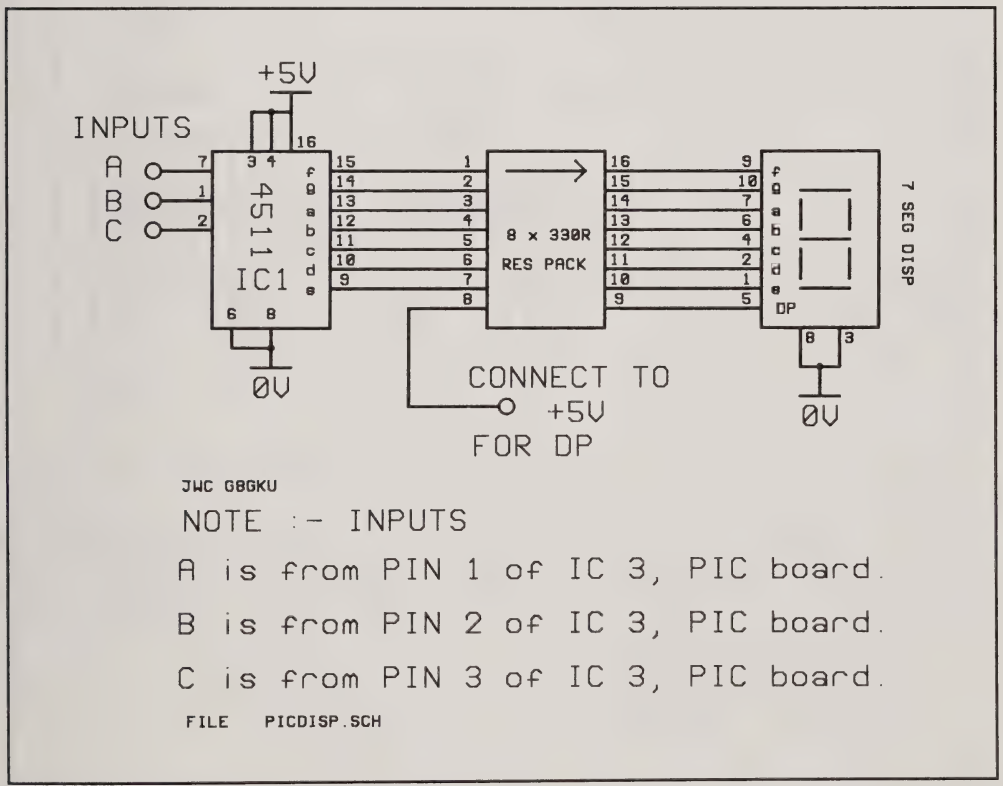


Fig 4. Display unit.

built to invert the slope of the varicap voltage or the existing varicap diode may be reversed. If this is done then ensure that *all* necessary dc considerations are met.

If the exact design and PCBs are used as in this article, then there is little likelihood that the circuits will not operate first time. As the overall system is complex it is not a realistic possibility to give a complete fault finding guide here.

Connections between the synthesiser board and the receiver should be kept as short and direct as tidiness will allow. The LO pick up is best made via a small value capacitor, perhaps 5pF, or, if you wish, via a single turn coupling loop placed loosely around the LO coil, passing the LO signal to the pre-scaler IC by means of a short length of miniature coaxial cable. It is possible that the LO, when connected to the pre-scaler, may 'see' the short length of coaxial cable as a tuned line and become unstable at a frequency determined by the length of the line and any loading capacity present. If this happens (unlikely) use a longer line and/or lightly load the line with perhaps a 100 ohm resistor at each end. You may need to use a buffer amplifier in stubborn cases.

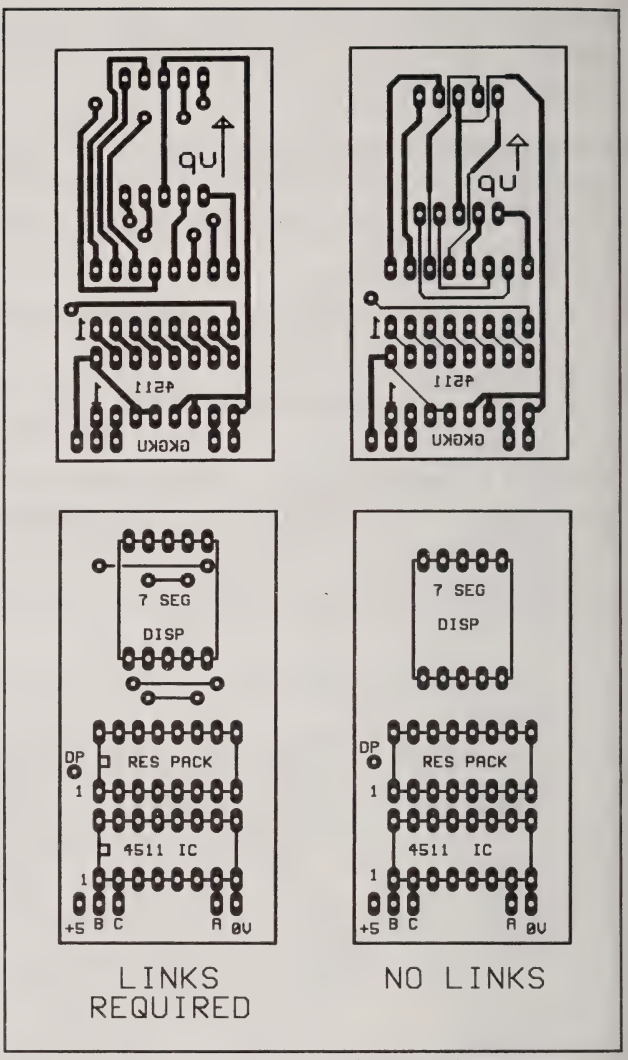


Fig 4a. Display unit PCB and parts placement.

FINAL TESTING

CPU Board

Beyond the tests already described there is little that can be done with the PIC con-

troller board. Readers with an oscilloscope may wish to check that the three outputs (Data, Clock and Enable) from the PIC board to the RF unit show the correct general type of signals. They are:

Data: A series of logic 0..1 changes which depends on the chosen frequency. There will typically be about five or six changes during the sequence.

Clock: Initially a logic zero, followed by 28 short logic 1 pulses before returning to a zero resting state.

Enable: Initially logic zero then logic 1 for the duration of the data transfer. Returns to the zero state at the end of the sequence.

The entire sequence takes just under 600 microseconds.

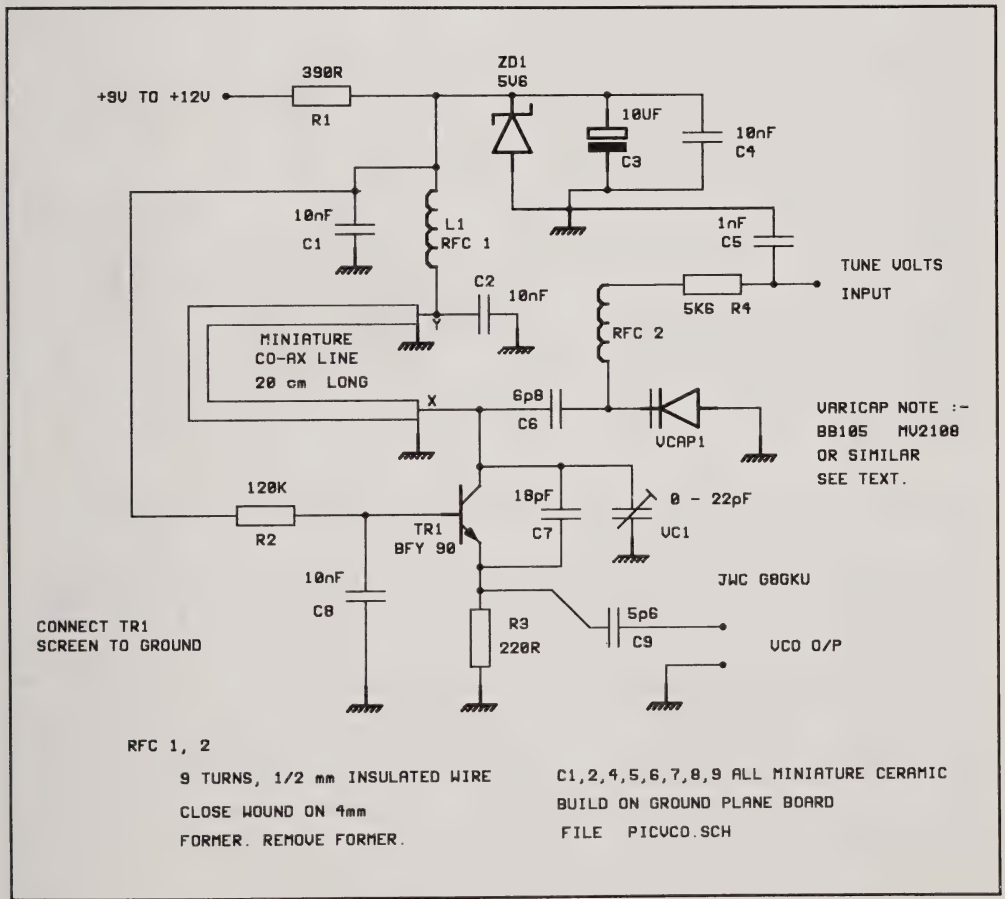


Fig 5. Local oscillator

RF Board

If you are using the optional replacement local oscillator then you are advised to set it up first. An oscilloscope is needed to easily set up the RF board but there are other ways. For example, by careful use of a frequency counter. The following sequence assumes a functioning local oscillator producing a signal in the region of 1 volt.

With the power turned off, firstly disconnect the varicap drive wire from the RF board to the varicap in the local oscillator and arrange for the varicap to be controlled via the slider of a 10k pot placed across the zero and +12V rails. Power up and set the pot to give a voltage in the region of 5V. Adjust the variable capacitor in the LO (or whatever method your LO has) to give a signal of 126.5MHz using either a frequency counter or a reliably calibrated receiver. When turned on at this time the 'PLL unlocked' warning LED should be illuminated.

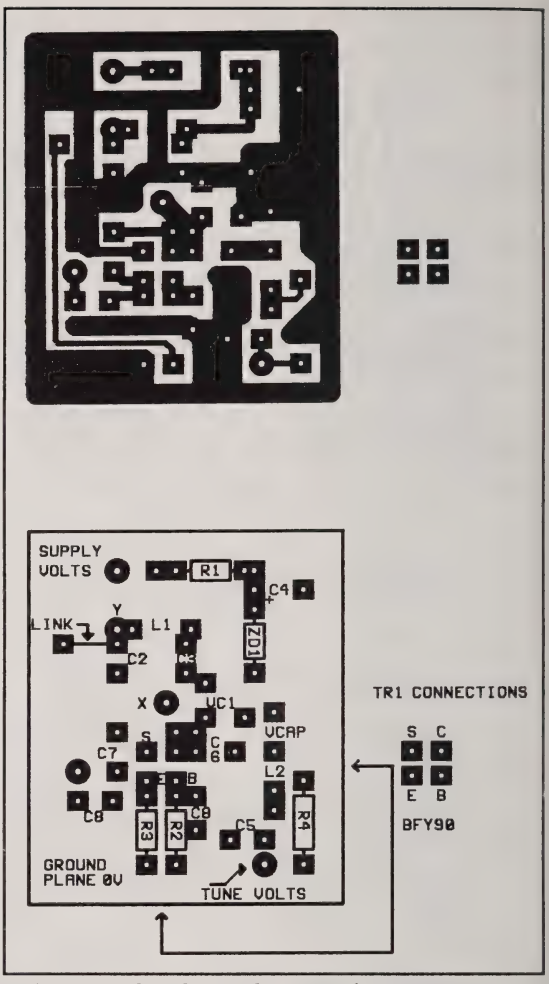


Fig 5a. LO PCB and parts placement.

Signal tests: Now is the time to adjust VC1, thus setting a suitable working signal level into the SP8715. With the LO supplying a signal in the region of 1V, place an oscilloscope probe (use the times ten setting) on pin 4 of the SP8715 prescaler IC. Initially, completely open VC1 so as to couple in the lowest signal level. The output as seen on pin 4 of the SP8715 should be steady, as there is no effective input. Slowly increase the signal coupling by gently closing VC1. The signal on pin 4 should at some point become a little twitchy making random transitions. Increasing the coupling will produce a very clean and solid square wave signal on pin 4. The frequency of this square wave should be close to 2MHz as the approximately 126.5MHz oscillator is being divided by 64 or 65. Make a mental note of the meshed state of VC1. Continue to increase signal coupling and you may find, as in the author's case, the signal on pin 4 changes abruptly to be a similar square

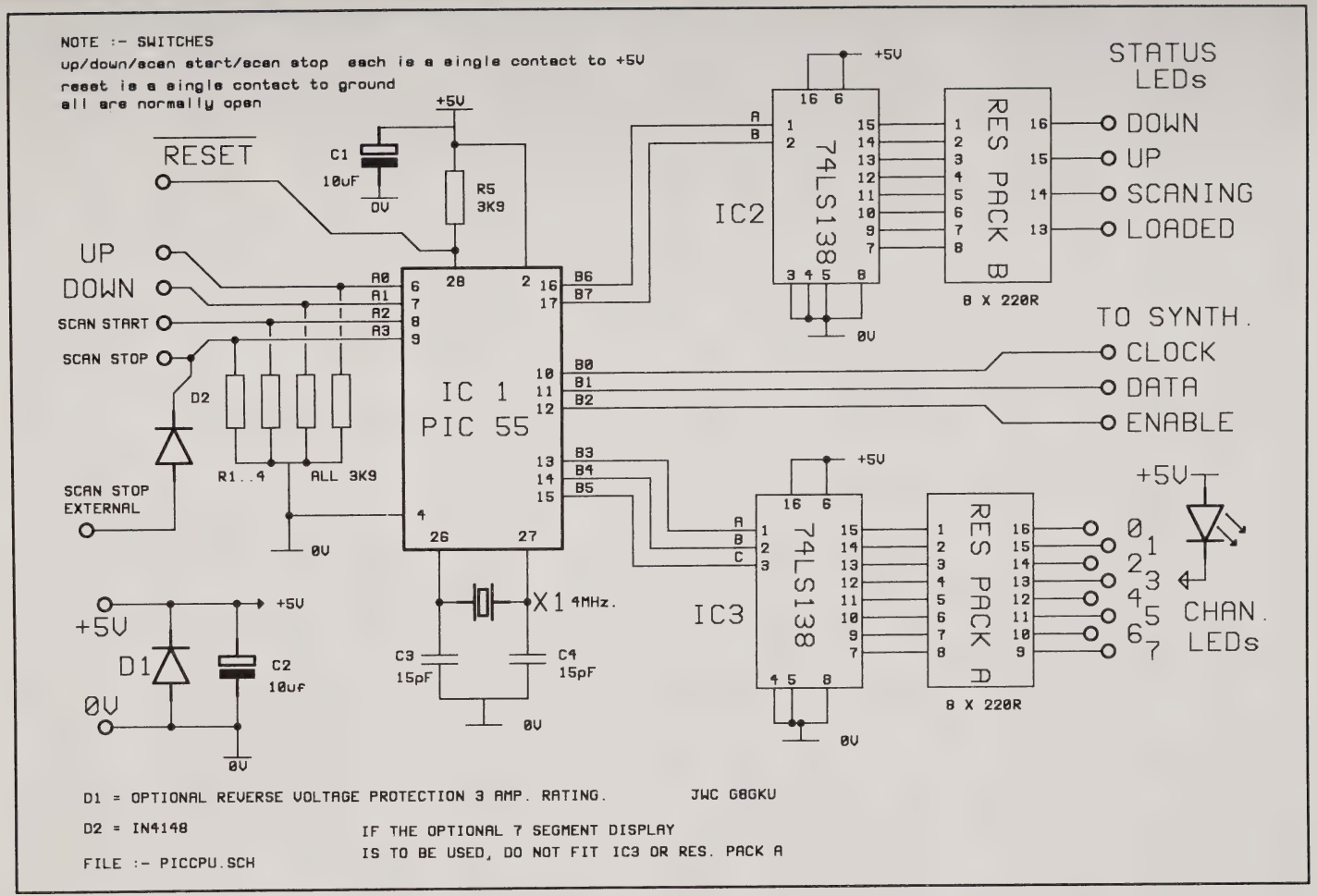


Fig 6. Synthesiser PCU.

wave but at twice the frequency. This may be a quirk of the 3 prototypes built by the author but is more likely to be a result of overloading the prescaler input circuit. The maker's data suggests that this may occur at an input level of 300mV but it does not appear to be harmful at modest signal levels. Finally, adjust the value of VC1 so that the SP8715 produces the first output mentioned above, setting VC1 in the centre of the region which produces the correct output.

Place your oscilloscope probe to pin 7 of the NJ8824 and check that the IC is being fed with a sine wave at a frequency of 4MHz. This is the reference frequency. If you have a calibrated frequency counter you may wish to trim the frequency to be as close to 4MHz as you can get it.

Further tests on the RF board can only be made if the NJ8824 synthesiser has successfully received correct binary data, which is assumed to be the case. Turn on and select channel '2' noting that the correct LO frequency for channel 2 is 126.8 MHz. Observe via your oscilloscope pin 1 of the NJ8824 IC and whilst doing so, manually (by means of the temporary tuning pot) swing the frequency of the LO from 126MHz to 127.5MHz, ie well below to well above the correct frequency. The logic level on pin of the NJ8824 should change state as the correct frequency is passed through during the sweep. Note that the voltage level will be high for a higher frequency and low for lower frequency. If this happens then you may rest assured that it is most likely that the synthesiser IC has been correctly programmed and is operating.

Next place your oscilloscope probe onto pin 6 of the OP07. The same LO frequency swing should be made and the same general effect should be seen. Note that the OP07 is used as an integrator and will produce the opposite voltage change with respect to pin 1 of the NJ8824. Confirm that the same effect takes place at the junction of D1 and R20, ie the drive point to the varicap diode.

Closing the Loop

If all the tests thus far have proved uneventful then is time to switch off and remove the temporary tuning pot and to reconnect the correct wire, ie from the junction of D1, R20 on the RF board to the varicap drive point on the LO. Re-apply the power and ensure that channel 2 is shown as the loaded channel.

Connect your oscilloscope probe to the varicap drive wire and set the vertical sensitivity to 2 volts per division, dc coupled. A frequency counter may be useful; connect it so as to read the LO frequency.

For those readers wishing to make a *temporary* connection to the (new) LO, board it is suggested that you place a 100R in series with a 10nF capacitor between the emitter of the BFY90 (TR1) and the frequency counter probe. This is to minimise any extra loading or shift in frequency caused by the addition of the counter probe.

After removing the temporary counter test feed, you are advised to reset the LO being passed into the SP8715.

Adjust the main tuning control (a variable capacitor or whatever your LO has) so that the frequency is close to 126.8MHz. Observe the voltage on the varicap drive wire and it should move up or down as you adjust the 'manual' tuning. If all is well, set the manual tuning such that the varicap drive voltage is about 4 or 5V (positive). When the loop is locked the 'unlocked' LED should become unilluminated. This is

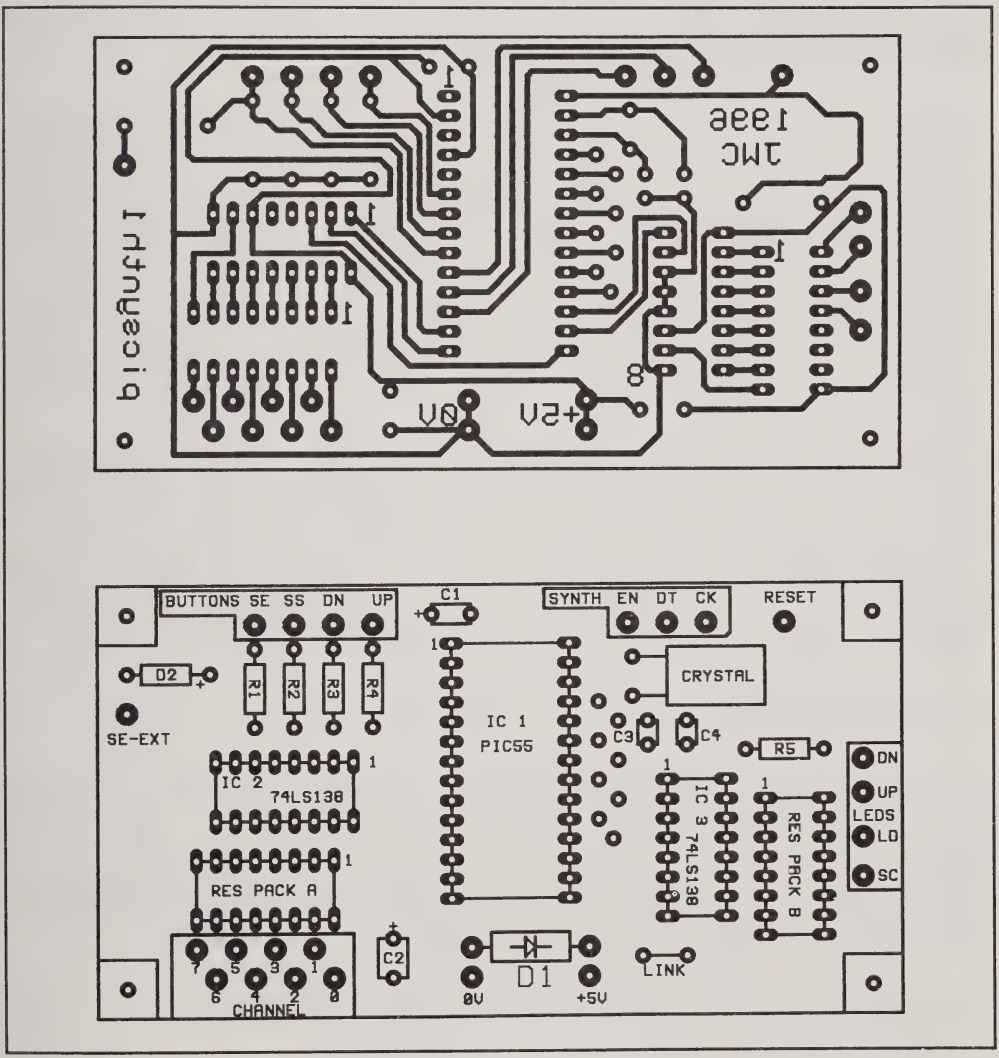


Fig 6a. CPU PCB and parts placement.

a good time to carefully trim the 4MHz crystal oscillator on the RF board so as to make the LO read as close to 128.6MHz as you can get it. If all is well at this stage you have very nearly completed the course. Change channel by using the up/down buttons and the correct frequency should be displayed.

Finally, select the scan start button, this should initiate a circular scan 0, 1, 2, 3, 4 and then repeat. Check that the frequencies are correct to within working limits. For those constructors wishing to use a 10MHz reference crystal there is version of PIC code supplied on the disk to cater for this option. Now is the time to complete the physical installation of the unit.

SOFTWARE AND RELATED COMMENTS

A single disk is available from the author containing all of the diagrams and notes relating to this project. On this disk will also be the software for the various methods of programming the synthesiser if the PIC unit is not wanted. All software listings have comments; hopefully readers will take the plunge and modify as needs perceive.

The PIC used in the prototypes is the UV EPROM version of the 16C55 PIC by Arizona Microchip. The code was developed on the PICSTART system as sold by Farnell at a cost of just under £100.

Readers may, if they have the required items of kit, programme their own PIC device or the author will undertake to programme readers' PIC devices *at the their own financial risk.* In order to allow for future code changes and updates or simply further experimentation, readers are recommended to use the UV EPROM version which costs about £20. A cheaper, but one time programme only, version is available for about £7 but this does not allow for either programming errors or future changes. In short, you pay your money and you take your pick.

FURTHER EXPERIMENTATION AND DEVELOPMENT

As presented, this design was developed as an experiment in producing a working system. In this respect the design 'as is' is acceptable. However, it is suggested that the PIC16C55 be replaced by a PIC16C71. This is an 18 pin device which may be placed upon the same board as the RF parts thus making a neat single-board solution. The artwork could be squeezed considerably; the present artwork is deliberately 'chunky' to enable easy home etching. Have fun; I did.

APPENDIX A PRINTING PRE-PROCESSED PCBs TO A DESKJET

Contained with other data on disk are PCB files which are ready to send to a HP

Deskjet or Laser printer. The files have been given suitable names and have the file type identifier of .L00. To print these files proceed as follows: Identify the one you wish to print and from the DOS prompt enter the following string terminated by return: TYPE A:FILENAME.L00>LPT1 where FILENAME is the specific file you wish to print. This assumes that your printer is connected to LPT1 and that the files are on a disk in drive A. Note that .L00 contains zeroes and not the letter 'O'.

APPENDIX B PRINTED CIRCUIT NOTES

All PCBs presented in the project have been designed with home production in mind and as such the tracks are usually about 1mm in width. Links have been kept to a minimum. Comments on the boards follow:

PIC controller: No special comments. Size to fit into a standard die-cast box.

RF Synthesiser unit: This *must be a double sided board* with the upper side a complete copper surface. After drilling lead holes countersink the ground plane copper surface with a 4mm twist bit in order to give a clearance for non ground wires. Note that on the layout diagram there are parts marked with a small letter X; these points should be soldered to the ground plane and thus do not need the earth plane countersinking. Size to fit into a standard die-cast box (see parts list). The pre-scaler IC is a surface mount device. On this PCB it has to be mounted directly on to the track, ie on the opposite side to the other components. Pin 1 is marked on the track. Solder with care as the pin spacing is quite close. *This board may be used with either a 4MHz or 10MHz reference xtal but each requires different software.*

Local Oscillator: Use double sided board remembering that the artwork will need to be reversed when photo processing as the board is a surface mount unit. No holes need to be drilled other than user-selected small mounting holes if needed. Double-sided sticky pads may be used to mount the board. Ensure that the bottom layer of copper is linked by several short wire links wrapped around the edge of the board to provide an electrical connection between the ground plane of the RF circuitry and the bottom copper screening layer. Another method is to drill about a dozen 1mm holes and fit pin-through links from the upper ground plane to the lower screen. Depending upon the exact type of miniature coaxial cable used, the length may need to be adjusted due to differing velocity factors. Build the board as detailed first and measure its working frequency range and adjust after this if necessary. If the frequency is too high, replace the line with one about 5cm longer and retest, cut off a little at a time until the correct centre frequency is reached. The prototypes covered from 116MHz to 133MHz.

Power supply: Use single sided board. No special comments but take care with the high voltage side of the transformers.

Seven segment display: Two versions are provided; one has thin track which may cause problems for home brewers and the other uses 1mm track and a few links which is easier to etch.

Acknowledgements: Thanks to GEC Plessey for inspiration in designing this synthesiser.

Further reading and research notes for PLL digital synthesis may be found in the three GEC Plessey books: IC Handbook (Professional Products), IC Handbook (Communications) and IC Handbook (Media). GEC Plessey are at 01793 518000 (tel) or 01793 51811 (fax).

Many thanks to Roland Hopkins, G3IWW, for endless proof reading.

Author's address: John Cooper, 44 Yarnells Hill, North Hinksey, Oxford, OX2 9BE.
Packet: G8GKU@GB7AVM.#49.GBR.EU

ANDREW McGUFFIE

Like many others, I was saddened to hear of the death of Andrew "Drewie" McGuffie on 23 September. Drewie had been battling with cancer but the end, when it came, was unexpected.

A radio amateur since shortly after the war - his callsign was GM3CEA - he became interested in weather satellite systems in the mid sixties and was one of the first to obtain good quality pictures with both home-made and modified commercial equipment. There was little or no data available in those days for constructors and many hours were spent building and then modifying receivers ready for the one daily pass each morning.

As technology advanced over the years, Drewie kept abreast of all the latest developments and built a system which would print pictures from images recorded on floppy disk and which were always of the highest quality.

We have not only lost a well liked RIG member, but a friend as well.
John Tuke.

WANTED: PRO SAT II card & software will pay £50.00 contact John Collins on +44 (0)1275 541813 or +44 (0)836 318605.

HRPT SATELLITE IMAGES FROM RUSSIA

Les Hamilton

One of the year's most fascinating revelations has been the extent to which Russia makes use of the HRPT data streams from America's NOAA 12 and NOAA 14 satellites. During the period from late March to the end of May 1996, Russia's Space Monitoring and Information Support Laboratory (SMIS) started to make segments of high-resolution NOAA imagery available over the Internet under the banner of its "Pavodok-96" project, the object of which was primarily to monitor selected regions of Russia for the purpose of detecting snowmelt flooding. Soon after the conclusion of this project, SMIS undertook "Forest Fires-96", an even more extensive monitoring program aimed at the speedy detection of forest fires; a venture that continues at the time of writing, even though the forest fire season is long past.

For each area monitored, SMIS processes all overhead NOAA passes, both during the day and overnight, and produces a 512 pixel square image for each of the five NOAA AVHRR channels. As an appetiser, the channel 4 image is made available as a GIF file but the pièce de resistance is a new specialised thematic data format (TDF) file, which contains the HRPT data for all 5 AVHRR channels in raw bitmap form. These images are updated up to six times per day depending on the region and the satellite pass schedules. The most recent image is generally posted on the Internet within an hour or so of processing and the best image of the day, provided it is not covered by cloud, is added to the permanent archive.

Although the daily GIF images provide an interesting view of parts of the Russian Federation, they are always 'overprinted' with the date and time of acquisition, and a latitude-longitude grid. An example may be seen in RIG 45, page 78. It is only from the TDF files that the original pristine images can be obtained.

Thematic Data Format (TDF) Files

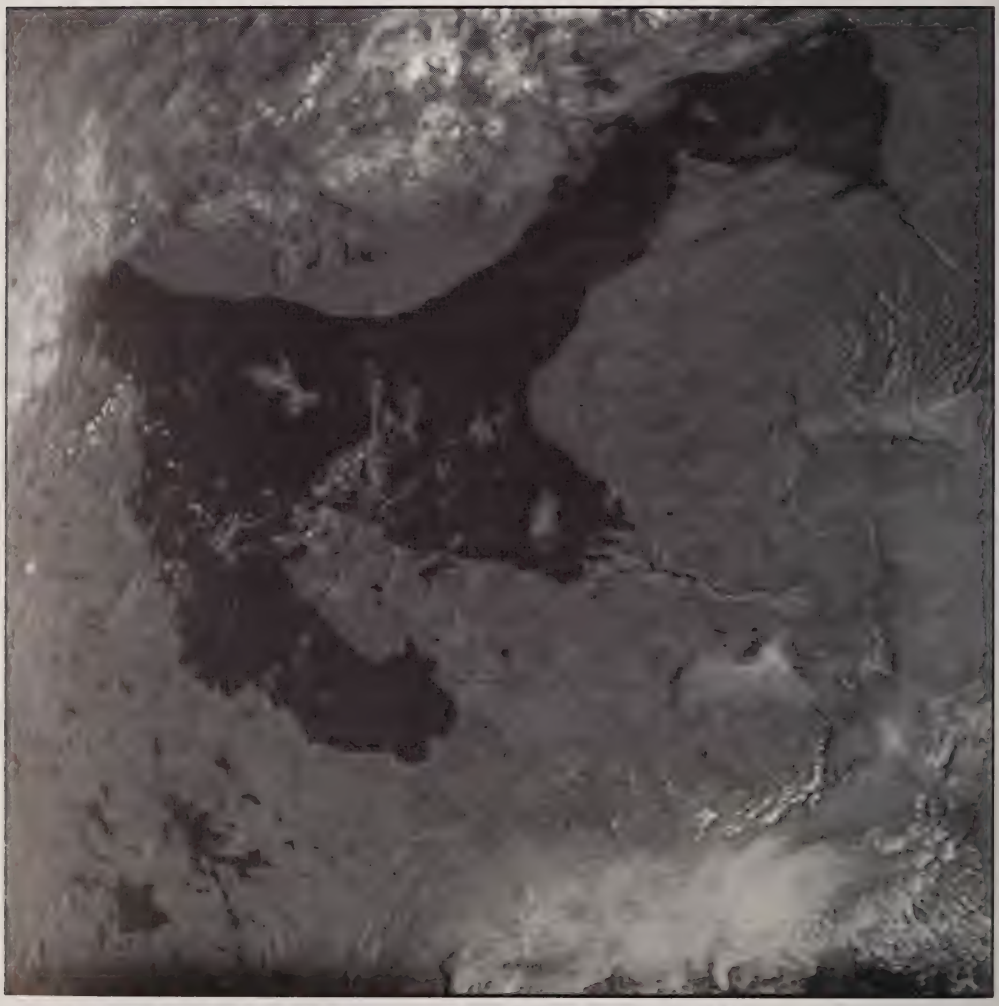
Since a single TDF file consists of five interleaved HRPT images plus the geographical grid overlay, it will come as no surprise to realise that it is a sizeable file; almost 1.6 megabytes of data. Moreover, because the five channels of data are interleaved in a pixel by pixel format, it is not possible to view the images with a conventional viewer. The TDF-View program produced by SMIS must be installed to do this. This viewer is also quite large; the compressed installation files weighing in at 1.2 Mb.

Three images are reproduced here and all are printed with north upwards. However, TDF files created from ascending images always store the image inverted, which means that the mid-day NOAA 14 images appear upside down. If you would prefer to be able to view such TDF images with north at the top, I can supply a small file

(FLIP_TDF) which will rewrite the data in the file accordingly (this can take up to 15 minutes per file, but only need be done once).

The TDF_View program

The TDF image viewer provided by SMIS is a Windows Program which reads in TDF files directly and allows you to flip from one image to the next simply by pressing the <Page Up> and <Page Down> keys. Although the software appears still to be under development (some menu items are unavailable as yet), it does offer some highly useful features, not least a comprehensive On-line Help in English.



Archangel'sk and the river Dvina. NOAA 12 CH2 22 July 1996.

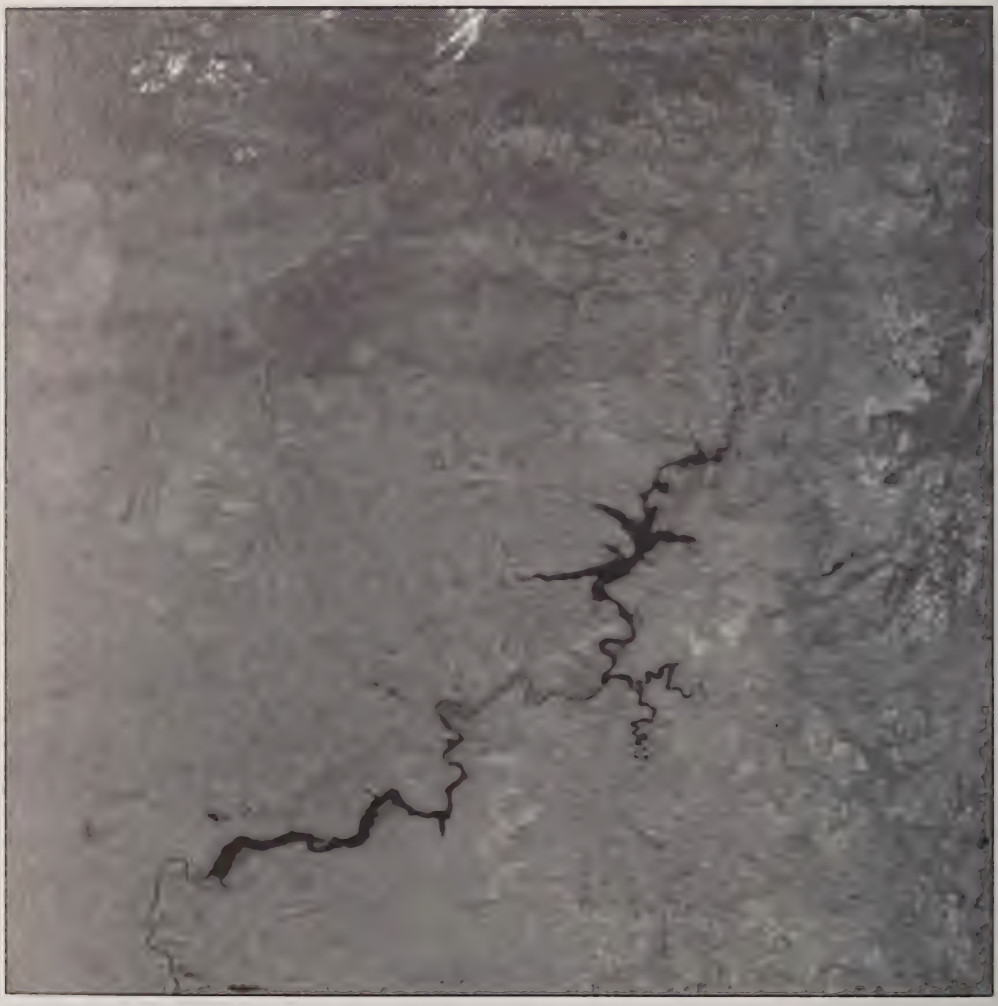
From the <File> menu you have the option to save the displayed image in GIF, BMP or TIF format; a feature that produces images free from superimposed text and grid. If desired, there is a text overlay option under the <Tools> menu by which you can add your own, customised text descriptions. The <View> menu has a zoom feature which allows you to zoom in on the main image and pan around by right-clicking the mouse over it.

Colour Composite Images

Another highly interesting feature in the <Tools> menu is the <Palette> option,

Aral sea. NOAA 14 CH2 29 August 1996. Route of railway visible to west.

which opens the way to producing colour images by combining any three of the AVHRR channels, and assigning them to red, green and blue. There is also a facility to increment or reduce the contribution of each colour to the final composite before saving your creation. Unfortunately, the <Save> feature of the colour image is not yet implemented, but images are easily saved by using the <Copy> option instead. This places the image on the Windows clipboard, so all that is needed is to load any Windows image viewer (Photolab is excellent), and <Paste> in the image, which can then be saved as GIF, BMP, TIF or whatever.



The river Kama at Perm. NOAA 14 Ch 2 11 July 1996.

Obtaining TDF Images

TDF images, and the TDF_View program are available over the Internet from SMIS. For those not fortunate enough to have access to this source, I can make a selection of images available on disks (see below). On the Internet, SMIS have their home page at "smis.iki.rssi.ru/". All features can eventually be located by browsing their pages but here are short-cuts to addresses for some of the more interesting areas for which TDF images exist.

smis.iki.rssi.ru/data/regions/europe/arhangl
smis.iki.rssi.ru/data/regions/europe/chechnya
smis.iki.rssi.ru/data/regions/europe/kanin
smis.iki.rssi.ru/data/regions/europe/karelia
smis.iki.rssi.ru/data/regions/europe/moscow
smis.iki.rssi.ru/data/regions/europe/perm
smis.iki.rssi.ru/data/regions/europe/rybinsk
smis.iki.rssi.ru/data/regions/europe/romania
smis.iki.rssi.ru/data/regions/europe/st_peter
smis.iki.rssi.ru/data/regions/siberia/aral

The TDF_View program can be obtained at smis.iki.rssi.ru/data/tdfview

There are some 60 areas listed, although not all of these are yet active, which is particularly true of the sites in Siberia. However, one Siberian site well worth visiting is the Aral Sea, as it does produce some superb imagery.

When downloading a TDF file, do check the time of its directory entry. If during the night, channels 1 and 2 will be black but the three infrared channels will provide images. Files posted between 0600 and 1800 will generally provide good images. Downloading can be slow at busy times and there appears to be a cut-off time of about 20 minutes so it best to avoid peak periods. SMIS is currently compressing its archives with PKZIP so older images download faster.

TDF Images on Disk

As an experiment during the current quarter, for RIG members who do not have an Internet connection, I am prepared to offer a set of six disks containing five of the TDF images featured in this article, the TDF_View program and my FLIPTDF.EXE utility. The TDF images are in the form of self-extracting archives in order to fit them on to a single floppy disk each. Just copy the .EXE file from a disk to your hard drive and run it to produce the TDF file.

TDF_View is also supplied as a self-extracting archive TDFV.EXE. which, when run

on your hard drive creates a directory DISK1 which contains the Windows installation files.

The above may be ordered in the same way as Shareware Library disks, ie £2 in coins or postage stamps, return postage, and a re-sealable package containing six formatted 1.44 Mb disks. Further details in "Shareware Corner" in this issue. Should this venture prove popular, it may be that more TDF images will be made available in the future through the GIF Library or the RIG BBS.

Images reproduced courtesy SMIS IKI RAN

THE MILLENNIUM SATELLITE

Frank Bell

There have been some important developments in the Millennium Satellite programme since I last reported to members. Although the details of the satellite's payload, frequencies and power budgets are still being actively researched, a working specification is emerging.

The insert sent with RIG Journal 45 produced a very good response from members and about 200 are now registered on the Millennium Satellite programme's data base. I cannot overstate the importance of the contribution that RIG members have made to this programme. We have been able to say to the Millennium Commission that a single mail shot to a potential user group has resulted in a very good response. This impressed the Millennium Commission and has contributed to the satellite programme's continuing success.

The Millennium Commission met on 25 September 1996 and at that meeting the Millennium Satellite was discussed. The report back from their chief executive was that the Commissioners are enthusiastic and supportive of the proposed satellite programme! Well, short of giving us the money there and then, this was the best news we could have anticipated. However, there are some strings, we still have to satisfy the MC on three issues before they will grant us the necessary money. We feel confident that within a few weeks we will be able to satisfy the MC on these additional points and then, hopefully, they will formally grant us 50% of the programme's costs.

Thanks to so many members for registering interest in the satellite programme; it was an important milestone. Before the publication of RIG Journal 48, the Millennium Satellite will, hopefully, be national news.

ON A WING AND A WOK

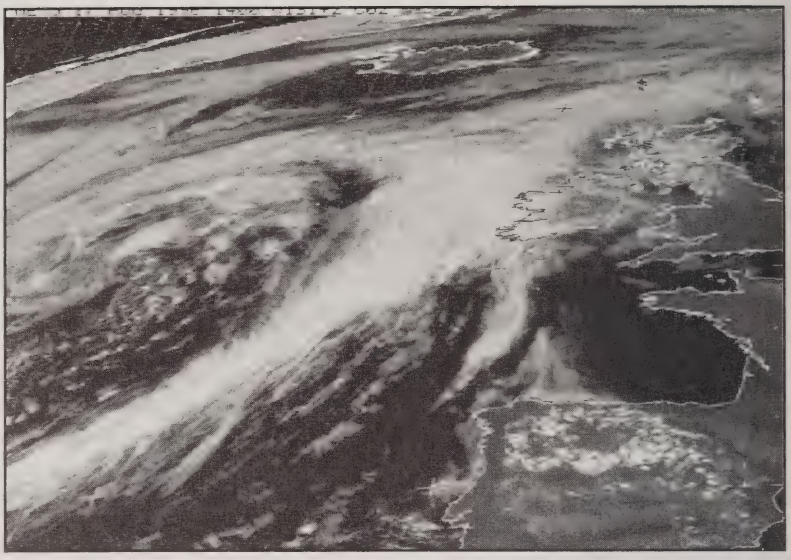
Frank Bell

I have two major interests that occupy my spare time. One of these interests is in satellites and remote imaging together with my activities with RIG as a committee member. The second long-standing interest is in old Citroen cars. I am the owner of a 1953 Traction Avant which, in England, is known as a 'Light 15' and both Nadine and I are fairly active in the Traction Owners' Club, (TOC). Now it has been my ambition to converge into one hobby these two seemingly different interests and, at last, I think I have the satisfaction of achieving this ambition.

As you can see from the photograph of the car, Traction Avants have elegant, curvaceous wings covering the front wheels. These are intended to be viewed from the top but from the underneath they have a distinct dish-like appearance. Agh; a dish! Now I use dishes in my other hobby. It just so happened that a few years ago I had replaced the wings on my Traction. The old wings have been lying around in a shed for several years. However, they were brought out recently with the intention of having them repaired and returned to useful service. They lay on my drive for a few weeks until I had the eccentric idea of trying to use one of the wings as a reflector to receive Meteosat images.

I had a suitable spare feed-horn which I connected to a Dartcom downconverter and then routed the signal to a Dartcom receiver followed by Timestep's PROsat II card in my PC. In the best tradition of technical hobbies a degree of experimentation was needed to determine the directional azimuth and elevation of the car's wing for best reception. The position for the feed-horn was found by identifying the maximum received signal strength as displayed on the receiver's 'S' meter. Nadine called out the readings from the shack as I adjusted the feed-horn position. I think the wing has a rather variable F/D ratio but perhaps that wasn't the prime consideration of the stylists and engineers who designed the wing.

As this was only to be a short-term experiment I decided not to permanently attach the feed horn to the wing with supporting arms but elected to hold it in position by hand. Anyway the wing already contained too many holes.



My normal Meteosat system runs from a 1m dish with the receiver's 'S' meter almost hitting the end-stop at 5+. I thought the car wing gave quite a creditable performance with 4.6 on the meter. The resulting pictures received were quite good and the slightly snowy appearance my be attributed to a shaking hand as much as intrinsic design faults in the wing. A C02 image is shown here. The authenticity of the image should not be doubted. From the header it can be seen that it was received in mid summer during the school holidays, in mid-afternoon and in good weather conditions. Exactly the time and conditions when innovative people should be experimenting in their gardens.

The fine weather shown in the image over the SE of England is not insignificant in this tale. Quite by co-incidence, next day I was instructed by her who must be obeyed, to go and buy a new, portable barbeque. (Our dog was to have a TOC barbeque in the garden with 12 human guests but this is another story.) Our old barbeque was deemed too ancient to cope. I did as bid and purchased a new barbeque. On unpacking it, in preparation for assembly, another thought struck me. The 55cm dia metal bowl of the barbeque was dish shaped, perhaps not parabolic, but neither was the Citroen's wing. I had to try the barbeque for Meteosat reception! It worked quite well but this time only 4.5 on the 'S' meter.

I wondered how far I could push Meteosat reception on domestic appliances. A wok? I tried it but this time only 4.0 on the meter and not much better than you can get by pointing the feed horn directly toward the satellite. The shape of the wok looked quite good but the 31cm diameter might have been the limiting factor.

I think the above experiments are the most eccentric ever carried out on the reception of Meteosat signals. Unless you know differently! ⊕

PROGRAMMING SEVERAL FREQUENCIES INTO JVFAX

Ken Johnson

The popular JVFAX programme has the facility to receive images whilst unattended at pre-programmed times but only for transmissions on the same frequency. In a few pages I will describe how I overcame this shortcoming and can now receive images on several frequencies without manual switching.

The first task was to write a short Assembler programme to toggle the data lines on one of the LPT ports. This was not easy for me as I have limited knowledge of Assembler coding for the 80x86 processors and Masm, the programme I used to assemble it and convert it to a .COM file. However, after consulting reference works in the State Library here in Hobart, I had a programme (just 40 bytes long) that could toggle any one of the 8 data bits of the printer port.

With the construction of a simple buffer board for my receiver, I could now change frequency between passes via the 'DOS command before receive function' of the Date Reception in JVFAX (more on this later). It then occured to me that it would be nice to be able to toggle any two of the data bits on the printer port so that I could switch contrast levels along with the frequencies. With just 20 bytes added to the programme I could now toggle two bits at a time. I have divided the port into two 4-bit ports as far as the programme is concerned with the first parameter controlling the lower 4 bits and the second parameter controlling the other four.

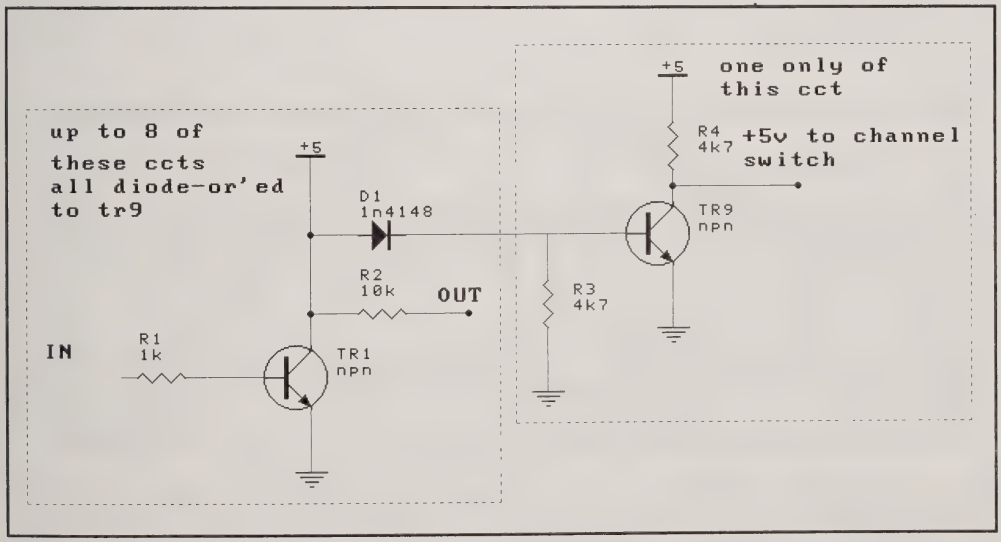


Fig 1. Buffer board circuit diagram.

I modified the original buffer board to include all 8 data lines from the printer port and added another switching transistor to disable the channel switch in the receiver when the computer takes over. When any of the data lines go goes high, the switch line goes low. My receiver uses a diode matrix to control the synthesiser, putting +5V on whichever matrix line is selected by the channel switch. By supplying the +5V to the channel switch from this switching transistor, the computer is able to take control of the receiver without my intervention.

For those who want only four control lines, the board is designed so that it can be cut in half between R10 and R11. I have included a 5V regulator on the board (U1 which is a 78l05) but this can be dispensed with if an alternative 5V supply is available. I always use double-sided fibreglass board using the top as a ground plane.

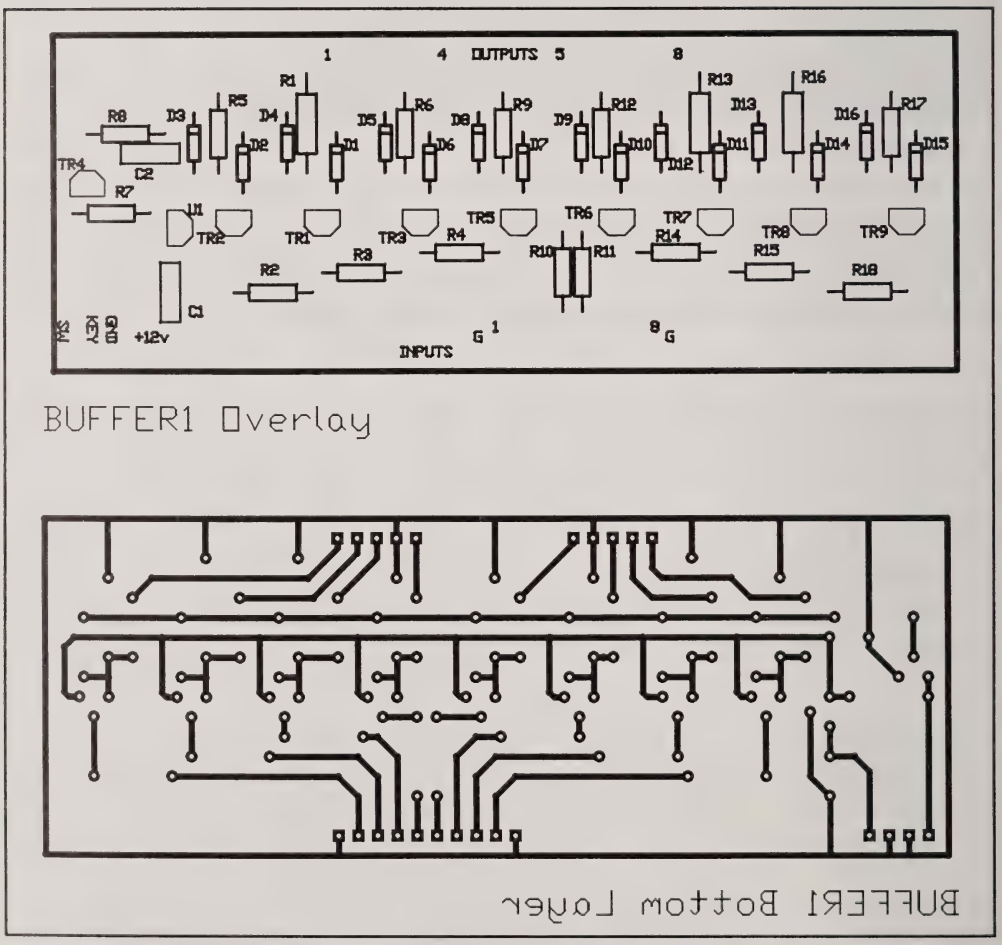


Fig 2. Component layout and PCB.

Assembler source code

```
free        segment word public 'code'
            org 0100h

            assume      cs:free,ds:free,es:free,ss:free
start       proc        near
            mov         ax,WORD PTR es:[5Dh]
            cmp         al,30h      ;less than 0?
            jl          quit        ;if yes, end program
            cmp         al,34h      ;more than 4?
            jg          quit        ;bomb out, invalid character
            cmp         ah,30h      ;less than 0?
            jl          quit        ;if yes, end program
            cmp         ah,34h      ;more than 4?
            jg          quit        ;bomb out, invalid character
            mov         cx,ax       ;store characters in cx also
            xchg        ch,cl       ;reverse order of characters
            sub         al,30h      ;then convert high bits to 0-4
            lea         BX,codeconv ;point to conversion table
            xlat                    ;convert chr
            xchg        ax,cx       ;swop characters for next conversion
            sub         al,30h      ;then convert high bits to 0-4
            lea         BX,codeconv ;point to conversion table
            xlat                    ;convert chr
            or          ax,cx       ;combine the two characters into ax
            mov         dx,0h       ;lpt1
            mov         ah,0h       ;printer chr. in al
            int         17h         ;print character
quit:       mov         ax,4c00h    ;exit with return code=0
            int         21h         ;return to dos
codeconv    DB          0,1,2,4,8
start       endp
free        ends
            end         start


Control.Com Hex Listing

26 A1 5D 00 3C 30 7C 2A 3C 34 7F 26 80 FC 30 7C 21 80 FC 34 7F 1C 8B C8 86
E9 2C 30 8D 1E 37 01 D7 91 2C 30 8D 1E 37 01 D7 0B C1 BA 00 00 B4 00 CD 17
B8 00 4C CD 21 00 01 02 04 08
```

However, I have included a ground track on the board in case anyone should prefer to use single sided board. I used BC549 transistors but any similar ones would do. Any low-current switching diodes will do; I used the 1N4148

The board is spaciously laid out with all connections brought to the edge so that connectors may be used. The circuit diagram shows only one of the data buffers; it is a simple common-collector (non-inverting) saturated switch repeated as many

times as required. All the data buffers are diode-or'ed to the common-emitter switching transistor.

Key in the short programme using any text editor and save it with a .COM extension (I called it CONTROL.COM. If you use a printer port other than LPT1, change byte 46 (the 00 immediately before the B4 00) to 01 for LPT2 or 02 for LPT3. Ensure that the programme is in the JVFAX directory and then run JVFAX. At the main menu select *Edit date files* and use [F2] to create a new date file. After entering all the information for the pass go to the *Execute DOS Command* at the bottom of the box and type in the name you gave to the programme followed by a space then two numbers, each between 0 and 4, corresponding to the data lines you want to switch. Zero is used to reset all four lines to the low state to return control to the receiver's channel switch. There must be no space between these two numbers. Below this entry appears *DOSCMD before RX?*, which should be set to 'Yes'. After entering data for all the passes required, return to the main menu, activate the date file using the 'Date File Reception' command and then select the relevant date file. Pop back a few hours later and see the results. It was a real pleasure to see it pick up 6 passes from three satellites on different frequencies. ⊕

AUTOMATIC CONFIGURATION OF JVFAX USING SATELLITE NAMES AS COMMANDS

Graham Spray

A method of correctly configuring JVFAX by simply typing the satellite's name at the keyboard is described below.

Firstly, a word of caution. This method involves changing the computer's AUTOEXEC.BAT file so it is advisable to make a copy of the existing file. A BOOT floppy disk, (a SYSTEM disk) containing AUTOEXEC.BAT and CONFIG.SYS should always be kept to enable re-starting of the computer following serious errors.

The following instructions assume that the computer is in DOS mode and that JVFAX.EXE and its associated files are in a directory called JVFAX with a sub-directory called CHARTS.

At the C: prompt type MD BATCH to create a BATCH sub-directory. Use DOS EDIT to create the batch files shown below then use SAVE AS to put them in the BATCH directory. The REM line states how to do this but do not type the REM line itself.

Next, use DOS EDIT to open the AUTOEXEC.BAT file and add ;C:\BATCH to the end of the PATH statement ensuring that the semi-colon immediately follows the last sub-directory on the line. Save the amended file.

To create configuration files for each type of satellite JVFAX has to be run several times. Run JVFAX and type C to enter the configuration screen. TAB down to Default picture directory line and type C:\JVFAX|CHARTS. TAB to the Callsign entry and type METEOR. (This is simply a way of recognising the screen among amongst other configurations.) TAB to Miscellaneous settings; press ESC and TAB to Initial RX mode then press the SPACE BAR until Mode 8 (Meteor N-S) appears. Press CTRL and ENTER simultaneously to return to the previous screen ant type CTRL and ENTER again to return to the main menu. Quit the programme and at the C:\JVFAX> prompt type COPY JVFAX.CNF METEOR.CNF to create a CNF file for Meteor satellites which METEOR.BAT will automatically load on execution.

Repeat this procedure for NOAA satellites altering Initial RX mode to read 7 NOAA S-N. Exit these screens as before, quit the programme and at the prompt type COPY JVFAX.CNF NOAA.CNF and repeat the procedure once more for OKEAN/SICH configuration using Callsign OKEAN and Initial RX mode 10. Exit the screens and type COPY JVFAX.CNF OKEAN.CNF. Modes 10 and 11 should have been pre-defined for Okean and Sich satellites as described in RIG 45, page 54.

Re-boot the machine and JVFAX should start upon typing NOAA. Check the settings then quit NOAA and check Meteor and Okean settings. The Okean setting is, of course, used for both Okean and Sich satellites. If any alterations are made to the Configuration screens whilst running JVFAX, then they will be saved back as before by the batch file when the programme is QUITted.

Here are the batch files to be created:

```
REM save as C:\BATCH\METEOR.BAT
CD\JVFAX
copy meteor.cnf jvfax.cnf
call jvfax
copy jvfax.cnf meteor.cnf
CD\
```

```
REM save as C:\BATCH\NOAA.BAT
CD\JVFAX
copy noaa.cnf jvfax.cnf
call jvfax
copy jvfax.cnf noaa.cnf
CD\
```

```
REM save as C:\BATCH\OKEAN.BAT
CD\JVFAX
copy okean.cnf jvfax.cnf
call jvfax
copy jvfax.cnf okean.cnf
CD\
```

A batch file can also be created for HF radio FAX reception using the methods above. but with Initial RX mode 1. Note that upper/lower case letters have been used solely for clarity. Commands to be executed in AUTOEXEC.BAT may be written in either.

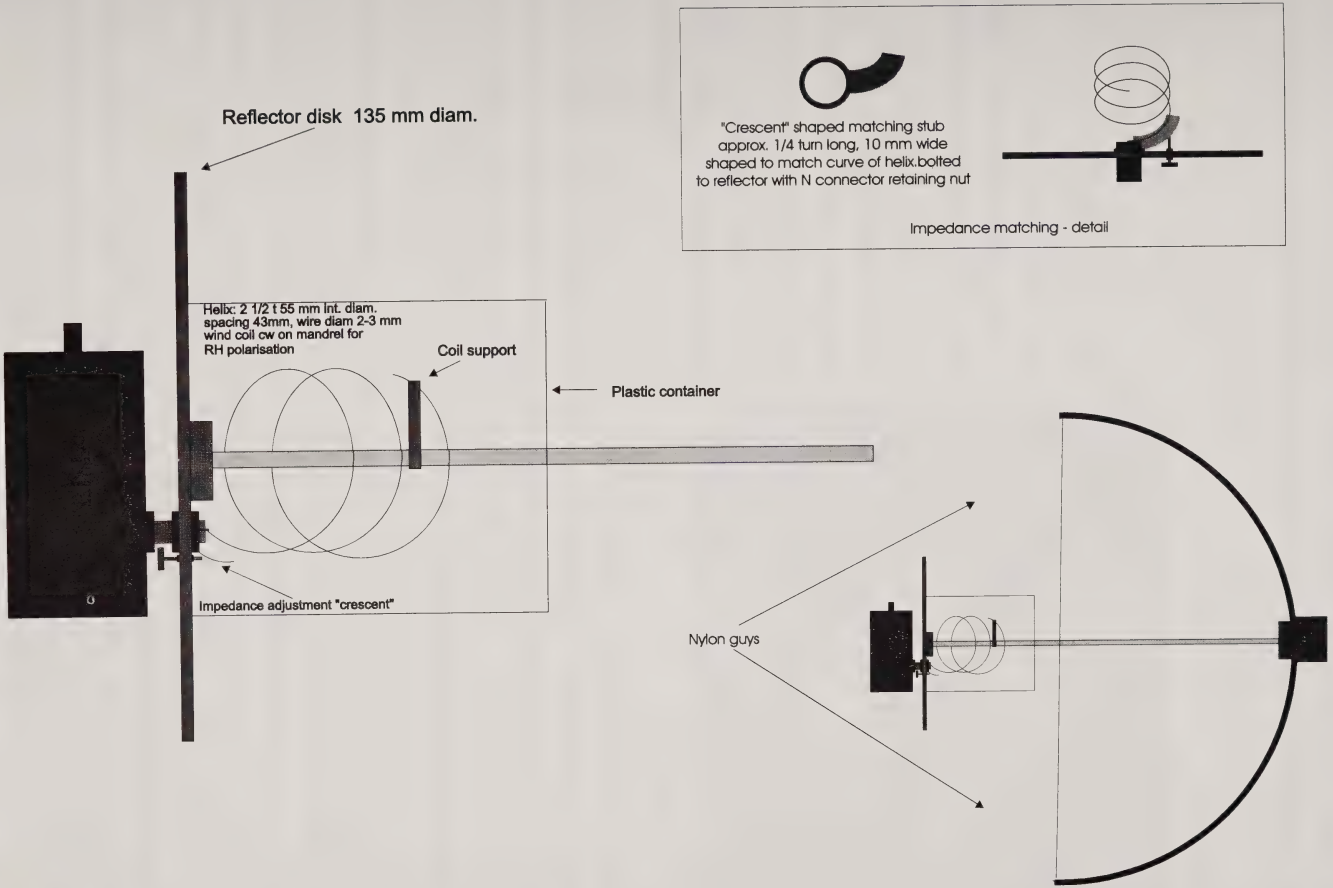
A PSEUDO-ACTIVE FEED FOR 1.7GHz

Chris van Lint

Many accomplished amateur weather-watchers have either taken the plunge or are contemplating the next move, ie from APT and Geostationary imagery to HRPT decoding. Reception of HRPT signals presents the operator with some totally new problems not encountered before. Although APT signals are circularly polarised, the reception of such signals is relatively easy and can be achieved by using a circularly polarised aerial, like the QFH or aerials using built in phasing such as the Lindenblad or a Turnstile with a phasing harness. Using phasing arrangements is reasonably simple because at these relatively low frequencies the potential losses introduced by such systems are manageably low. On the other hand, trying to receive a relatively wide bandwidth signal at 1.7GHz becomes an entirely different proposition and every dB of signal must be preserved if a low bit-error rate is to be achieved. Additionally, steps must be taken to minimise mechanical and electrically induced noise.

When I first started receiving HRPT, some 6 years ago, I used a 120cm dish and a "coffee can" type feed with a single probe. I was aware that such a linear polarisation arrangement does not produce the maximum gain available at the focus point in the dish and that in fact, depending on a number of other factors, the gain is about 3dB less (in terms of power), as compared to a circularly polarised feed. I added another probe to the feed at 90 degrees and used a combiner and a phasing harness to obtain a circularly polarised signal at the input of the LNA. This approach has a number of disadvantages in that the LNA cannot be placed directly at the incoming signal source. Also, construction of the coax cable harness is critical, as the cables must be of exact *electrical* length, which is difficult to achieve without appropriate test equipment. Furthermore the connectors on the phasing harness to the feed and LNA, as well as the combiner itself, inevitably introduce insertion losses and by making some observations under dynamic conditions, using a microwave coaxial relay switching from linear to circular polarisation, I came to the conclusion that there was not a great deal of difference. Living in the tropics opened the door to other potential problems with the connectors and harness and I decided to return to linear polarisation.

About three years ago I became aware that a helical feed could be used to produce a circularly polarised signal at the feed point. More recently, an article appeared in RIG 40 in which JC Beneche describes such a feed. Because the inherent nominal impedance of such a helix is 140Ω, an impedance-matching device is required and this means using additional connectors and matching lines between feed and LNA. Since the noise factor of the system is determined by the LNA, it is desirable not only to use a low noise LNA but to connect it as close as possible to the feed. The thought occurred to me, that since most LNA devices use N type connectors with a


Reflector disk 135 mm diam.
Helix: 2 1/2 t 55 mm Int. diam.
spacing 43mm, wire diam 2-3 mm
wind coil cw on mandrel for
RH polarisation
Coil support
Plastic container
Impedance adjustment "crescent"
Nylon guys
"Crescent" shaped matching stub
approx. 1/4 turn long, 10 mm wide
shaped to match curve of helix.bolted
to reflector with N connector retaining nut
Impedance matching - detail

relatively long flange (the TimeStep LNA is one of them), it should be possible to connect the helix directly to the N connector. A stub match in the shape of a "crescent" would be suitable as an impedance match. Thus the "pseudo-active feed" was born.

Construction

The feed consists essentially of a reflector, the helix and the matching stub. The reflector disk is constructed from some aluminium sheet to the dimensions shown in the drawing. Affix a length of PVC tubing at right angles to the centre of the reflector, eg by gluing a wooden dowel to the inside of the tube and using a wood screw, together with some epoxy based adhesive. The length of the tube depends on your focus point. In my case I was lucky enough to find a handle for a window-cleaning sponge, which had a telescoping arrangement in the centre, which made focusing very straight forward. The number of turns to be used for the helix depends on the f/d ratio of your dish and ranges from 2-3 turns for f/d ratios 0.3 - 0.5. My dish has an f/d of 0.42 and after extensive experimentation I settled on 2.5 turns. The actual helix should be constructed from copper wire heavy enough to give the helix adequate stability and I used copper tubing with an outside diameter of about 3mm. The circumference or actual length of each turn of the helix should equal λ, hence the diameter of each turn in theory must equal λ/π, where λ equals the *electrical* wavelength. In practice I determined that a mean diameter of 56.5mm is about ideal for the particular tubing used. Wind the coil clockwise on a suitable mandrel (I found that a 142ml Lea and Perrins Worcestershire sauce bottle is near enough correct). This produces a coil whose turns run LH, which once inverted by the dish results in RH polarisation. Flatten about 4mm of the coil at the start and drill a small hole through which the connector pin of a male N-connector can be snugly inserted and soldered into position at right angle. Position the hole through which the LNA N-connector protrudes so that the coil is in the centre of the reflector.

Next, prepare the matching stub from any conducting springy material. A piece of thin brass would be ideal. The stub should be about 1/4 turn in length and 10 mm wide, and cut to match the shape of the first 1/4 turn of the feed end of the helix. Make the "crescent" wide enough at one end to allow a hole to be punched through, which is big enough to slip it over the flange of the N connector. Insert the LNA and push the pin of the helix into the N socket. Adjust the LNA side nut on the N connector to allow a minimum of flange to protrude on the active side of the reflector. Slip the stub in position and tighten the nut, ensuring that the crescent follows the shape of the first 1/4 turn of the helix. Remove the helix. Before fixing the stub permanently, drill a small hole near the "hot" end of the stub, to allow positioning of an adjustment screw. Cut a thread in this hole to match the thread of the bolt and insert the bolt together with a retaining nut at the outside and tighten the LNA to the reflector. Again make sure that the matching stub follows the contour of the

first 1/4 turn of the helix. Re-insert the helix and select a suitable spot on the PVC centre support, where a small plastic pipe can be fitted at right angles, which, with a notch at the other end, will support the helix turn furthest away from the reflector. Cut a suitable piece of thin tube, cut a slot on one end and drill a suitable hole in the main support through which the tube is inserted and glued into place with the helix seated in the notch. Secure the helix in the notch with a little epoxy.

In your local supermarket, locate a clear plastic container (not polyethylene) big enough to accommodate the coil assembly, which can be used as a cover. Drill a hole in the centre of the bottom, big enough for the centre PVC pipe to snugly pass through. Glue the open end of the container to the reflector, initially with super glue and once set with some epoxy. Apply some epoxy around the area where the PVC pipe exits through the bottom of the cover.

The cover serves a two-fold purpose when a centre feed is used. Since the helix is not soldered to the N connector, but simply inserted as though it were a plug, it would be desirable to keep rain and humidity out. The container will also add stability, because it is glued to both the reflector and the centre support arm. The completed assembly may now be fixed to the dish. Again a piece of wooden dowel inside the PVC support will allow this to be screwed to the centre of the dish. If desired a wider sleeve may be glued over the end of the tube to increase stability. I drilled three small holes in the reflector spaced equi-distantly and attached some thin nylon from each hole to the dish to act as guy lines. If you prefer to use a conventional tripod mount for your feed, you can attach the arms directly to the reflector or allow for mounting lugs during reflector construction.

Adjustment and results

With an incoming signal adjust the screw below the matching stub and move the "crescent" closer to or further away from the "hot" end of the helix for maximum signal and lowest noise and tighten the retaining nut. I find that this can be done most conveniently by pointing the dish to a geostationary satellite such as GMS, GOES or Meteosat, using a suitable receiver with an S meter.

With this feed arrangement I have been able to reduce my dish size to 102cm, which here in Hong Kong is quite advantageous, because of the frequent typhoons which make it essential to keep wind loading to a minimum. Because of the relatively small dish, I have been able to devise a simple mounting arrangement to attach the dish to the stand. This enables my wife to remove the dish single-handedly, should a typhoon threaten during any absence from home. I have the apartment blocking my view to the north and north east but facing south I have a clear view of the sea, albeit partly blocked by some mountains about 4 km away. Notwithstanding these limitations I can get AOS or LOS depending on the direction of the pass at an angle just above the horizon if the satellite rises or sets in those areas which are not obstructed by mountains, using the Timestep HRPT gear. Because there are no obstructions towards the west, extending north west, I can get impressive imagery from satellites passing well to the west of my location, often decoding images so far to the west, that Hong Kong is well outside the imaging area of the bird. One such image appeared in RIG 45, p102. Because of my small dish size it is even more critical to conserve every dB of gain and this is the reason why I chose a centre mount, which not only makes focusing simple but also does give some (admittedly small) reduction in mounting hardware shadow. ⊕

AUTOMATIC TRACKING - AN UPDATE

Sam Elsdon

The tracking controller described in RIG 46 has attracted some interest so, here are some comments arising from a few telephone conversations and some personal views on what can be done to enhance the controller.

To improve compatibility with different Tracking Interfaces (TI), the position sensing voltage to the rotators could be made variable. Adjusting for the maximum input permitted by your chosen TI improves the resolution of the system. As described, the interface supplies 5V dc to both position sensing potentiometers. This could be made into a variable supply by using the well known LM317 regulator and having a voltage adjustable up to, say, 8V which would be a reasonable step if you are using the full travel of both azimuth and elevation rotators. However, when using a common voltage for azimuth and elevation in a system using only 90° of elevation rather than the full 180°, the resolution in the vertical plane will be lower than it could be. That said, my system uses only 90° with a supply of 5V (maximum of 6V for my TI) and the resolution seems perfectly adequate.

A better solution would be to make both azimuth and elevation voltages independently variable. This can be tackled two ways - either have separate voltages to the rotators (simple electronics but possibly more cabling required) or retain the common voltage to the rotators and place an amplifier in the path of each returned

position voltage (no change to the cabling but more complex electronics).

A rather alarmed Paul Gabriel called from Romford to question whether my statement that RotorInterface-2 only provides 90° of control in elevation was correct. I must own up to not wording that part very well. It was rather late in the article that RotorInterface-2 was teamed up with Instantrack which is what puts the 90° limit on it. Paul pointed out that RotorInterface-2 is specified for use with an HRPT package supplied by Orbit Electronics in Germany. He kindly demonstrated to me that, used with this package, a full 180° of elevation travel is possible. Thanks for that, Paul.

Mick Finney from Chesterfield is keen to get going on HRPT and called with a few questions, one of which was whether I had tried FODtrack. This package was devised by Manfred Mornhinweg (XQ2FOD) and is the package from the RIG BBS that I mentioned in the article. Mick kindly sent me a copy along with a ready printed schematic of the interface and a proposed PCB layout that he had devised.

The interface itself looks very simple to build but does use a rather pricey D/A converter, namely the AD7226. This is currently about £25 + VAT from Electromail and is a quad D/A converter ie it can create four analogue outputs from multiplexed digital inputs. The input data corresponding to a particular output is latched internally according to the signals on two address lines. The same effect could be produced with some very cheap D/A devices and a bit of simple external logic to latch the data.

The beauty of FODtrack is that it is easy to implement and interfaces directly to the Yaesu and Kenpro controllers or the one I described in RIG 46. Sadly, the software cannot cope with the transition from the year 1999 to 2000 - the pointing angles jump to completely different values. If this is updated by the author, FODtrack would make a perfectly sound solution for automatic tracking but will require either a separate computer or a multitasking environment on an existing computer. If running a separate computer, nothing special is required here as there are no fancy graphics.

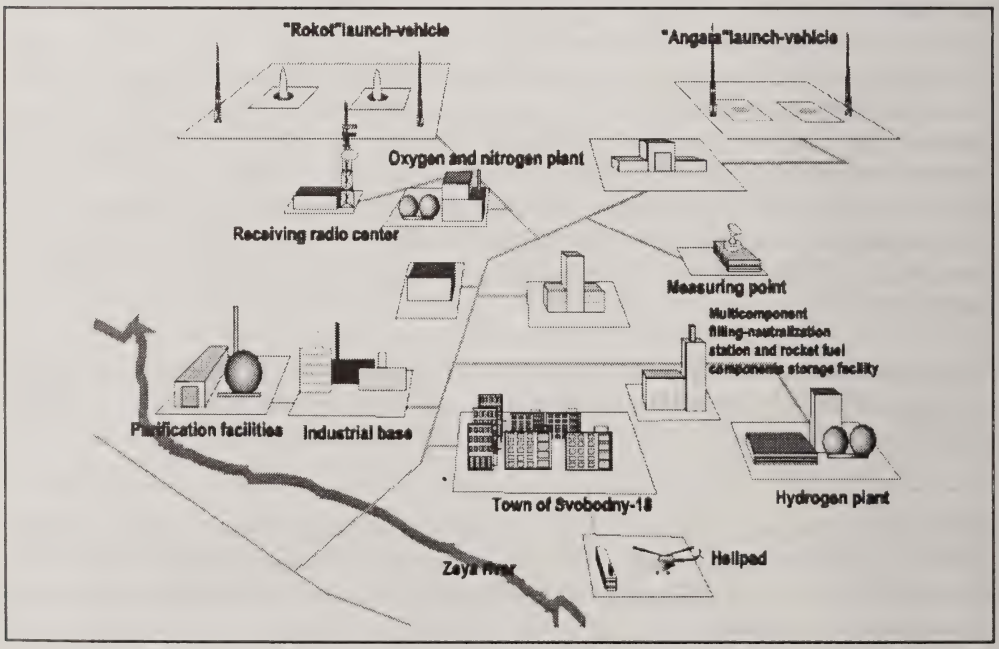
Incidentally, Mick is keen to contact someone local to himself who has experience of building an HRPT system. If anyone would be willing to help, please give me a call and I'll put you in touch. My phone number is in the front of the journal. ⊕

FOR SALE: Dartcom Meteosat DCV in weatherproof box with lead. £95. Martelec MSF30 dipole feed £20. Microwave Modules 1691MHz preamp £35. WANTED: Timestep PROscan rx, PROsat II card/software, Martelec JVF2 interface unit. John Crawshaw 01253 594381.

RUSSIA BUILDS NEW COSMODROME IN THE FAR EAST

Russia's two launch sites are currenty at Plesetsk which lies to the south of Archangel at latitude 63 degrees north and Baikonur (near Tyuratam) to the east of the Aral Sea at latitude 46N. The latter is now in sovereign Kazakhstan following the breakup of the former Soviet Union and, although agreements are in place allowing Russia to use the facilities at Baikonur for 20 years, the Russians have decided to build a new cosmodrome within Russia. The northern cosmodrome is ideal for high inclination polar orbits but is unsuitable for low inclination ones and especially geostationary orbits. Energy needed to compensate for the reduced eastward speed of the launch site (due to the Earth's rotation) and the orbit plane changes needed would penalise the payload weight significantly.

Of the three sites considered, Svobodny was finally selected for the new cosmodrome. It is situated about 500km northwest of Khabarovsk near 52N, 128E. The first stage of construction will convert five of the silo launchers vacated by military personnel following the Strategic Arms Limitation Treaty into satellite launchers. The first launch, by a relatively small Start-1 rocket, is scheduled to put an American-made mapping satellite into orbit before the end of 1996 and the first Rokot launch is expected in 1997. Additional facilities will be built later for the new heavy-lift Angara rocket. The Angara will be able to launch heavy payloads into polar sun-synchronous orbits from Svobodny. This is not possible from Plesetsk which has no facilities for the present heavy-lift Proton rocket.



VOLCANIC ERUPTION IN ICELAND

Peter Wakelin

Background

Iceland is the largest wholly volcanic island on Earth and over 10% of its surface is covered by glaciers up to a kilometre thick (Fig 1). Volcanic eruptions are common on the island and the strongest recorded eruption took place in 1783 at Laki fissure. On that occasion over 12 cubic kilometres of lava and 10 million tons of sulphur dioxide spewed out killing over 10,000 people and three-quarters of the island's livestock.

Inevitably, some eruptions will occur beneath glaciers and the consequent glacial floods can be catastrophic. Following the 1918 eruption of Katla, a volcano under the Mýrdalsjökull glacier, the flow of floodwater exceded 100,000 cubic metres a second.

The September 1996 Eruption

The eruption on 30 September occurred under the largest glacier, Vatnajökull, and was preceded the day before by an earthquake near the Bárdabunga volcano. Fig-

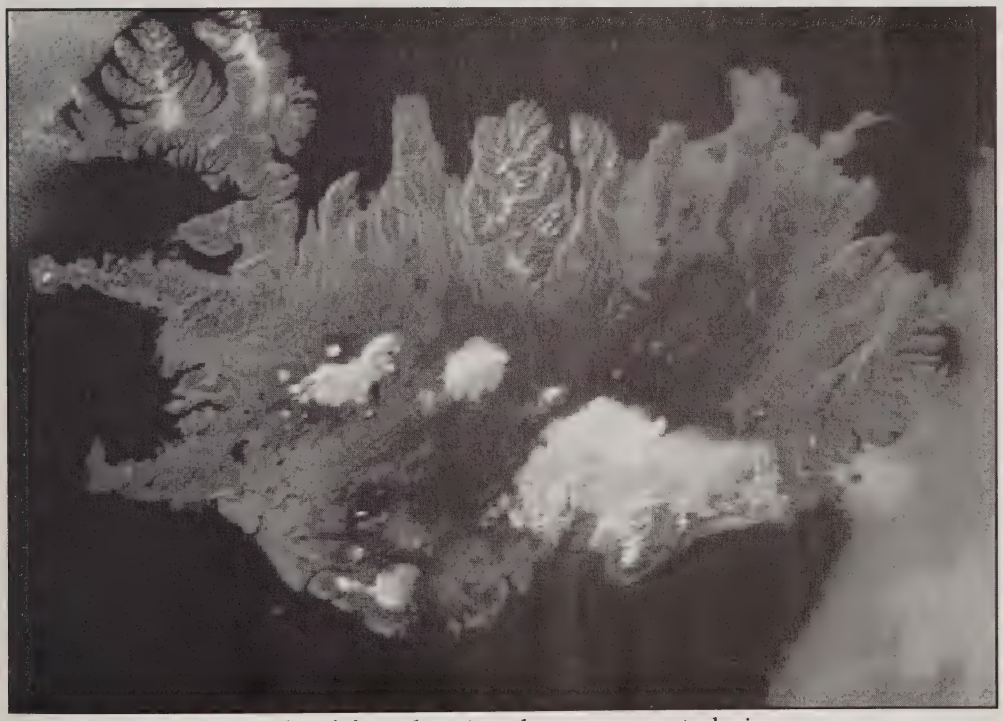


Fig 1. Iceland almost cloud-free showing the permanent glaciers.

Fig 2. ERS-2 radar image 6 October 1996.

ure 2 is a radar image from ERS-2 taken on 6 October and shows the eruption area between the Bárdabunga, Hamarinn and Grímsvötn volcanoes.

In the early stages of the eruption, 1000C magma melted an estimated 2.4 cubic kilometres of ice and this water flowed into the Grímsvötn caldera raising the level of the ice above by more than 80m (as at 16 October).

Drainage of the excess water in the caldera will probably be to the south, down to Skeidarársandur (Fig 3) endangering the ring-road around the island. Destruction of bridges spanning the glacial rivers would mean a detour of 650km for the road supply of southeast Iceland. In event of drainage occurring to the west, dams and hydroelectric plant on the Tungnaá river would be at risk.

Fig 3. ERS-2 radar image 8 October 1996.

Ice melting at the base of the glacier caused a 6km line of depressions to form on the surface on 1 October. The colour photograph on the back cover shows two of these depressions, each about 2km across and 100m deep. On the following day, the eruption forced its way through the 450-600m thick ice creating a cloud of ash, volcanic gases and steam (Fig 4).

Acknowledgements

I am grateful to Bettina Mueschen and Christophe Boehm of the German Remote Sensing Data Center, Deutsche Forschungsanstalt fur Luft- und Raumfahrt eV for providing the ERS images and the report from which most of the above was extracted [URL: http://www.dfd.dlr.de/HOT-TOPICS/volcano]. The two photographs taken from aircraft are copyright Isleifur Ottessen, Leiguflug, Reykjavik, Iceland.

Fig 4. The eruption broke through the ice on 2 October 1996.

NEW SATELLITE IN 137-138MHz BAND

The High Energy Transient Experiment satellite, expected to be launched in early November, will continuously transmits a 300 bps packetised data stream on 137.963MHz. HETE, a 120kg satellite will carry three instruments; a gamma-ray burst detector; an X-ray camera viewing the sky through a coded aperture and ultraviolet cameras. The planned lifetime of the satellite, which will be in a 550km, 38-degree inclination orbit, is six months.

HETE will be launched, together with the 180kg SAC-B spacecraft, on a winged Pegasus-XL launch vehicle carried to about 13km altitude by a L-1011 aircraft to the release point some 180km east of Wallops Flight Facility.

PREDICTED TIMES (GMT) FOR AQUISITION OF SIGNAL FOR 52.5 DEG NORTH, ZERO DEG EAST

	NOAA 12 Period 101.27 mins 137.50MHz				NOAA 14 Period 102.06 mins 137.62MHz				METEOR 3-5 Period 109.41 mins 137.85MHz		SICH 1 Period 97.78 mins 137.40MHz			
	S' bound		N' bound		S' bound		N' bound		N' bound	S' bound	S' bound		N' bound	
10 Dec	0626	0806	1615	1753	0206	0347	1159	1339	0757	0948	0715	0854	1959	2135
11	0603	0744	1731	1912	0155	0336	1148	1328	0739	0930	0604	0742	2025	2202
12	0541	0722	1709	1850	0144	0325	1138	1317	0721	0912	0631	0809	1917	2051
13	0659	0840	1648	1828	0133	0314	1127	1306			0658	0836	1942	2118
14	0638	0818	1627	1806	0122	0303	1117	1255			0547	0725	2007	2145
15	0616	0756	1744	1925	0112	0252	1244	1426	INSUFFICIENT		0614	0752	1859	2034
16	0734	0914	1722	1903	0241	0422	1234	1415	DAYLIGHT		0640	0819	1924	2101
17	0712	0852	1700	1840	0230	0411	1223	1404			0529	0707	1950	2128
18	0651	0831	1639	1818	0219	0400	1212	1352			0556	0734	1841	2016
19	0629	0809	1618	1756	0208	0349	1201	1341			0623	0802	1906	2043
20	0607	0747	1734	1916	0157	0338	1151	1330			0512	0650	1932	2111
21	0545	0725	1712	1853	0147	0327	1140	1319			0539	0717	1824	1959
22	0703	0843	1651	1831	0136	0316	1129	1308			0606	0744	1849	2026
23	0641	0821	1630	1809	0129	0305	1258	1440			0454	0633	1915	2053
24	0619	0759	1608	1747	0114	0254	1247	1428			0521	0700	1806	1942
25	0558	0738	1725	1906	0243	0425	1236	1417			0411	0548	1831	2009
26	0716	0856	1704	1844	0233	0414	1225	1406			0438	0615	1858	2036
27	0654	0834	1642	1822	0221	0403	1214	1355			0504	0642	1748	1924
28	0632	0812	1621	1800	0211	0352	1204	1344			0353	0531	1814	1951
29	0610	0750	1738	1919	0200	0341	1153	1333			0420	0558	1840	2019
30	0548	0728	1716	1857	0149	0330	1142	1322			0446	0625	1731	1907
31	0706	0847	1654	1834	0138	0319	1132	1311			0336	0513	1756	1934

	NOAA 12				NOAA 14				METEOR 3-5		SICH 1			
	S′ bound		N′ bound		S′ bound		N′ bound		N′ bound	S′ bound	S′ bound		N′ bound	
01 Jan	0644	0825	1633	1812	0127	0308	1300	1442			0402	0540	1648	1823
02	0622	0803	1612	1750	0116	0257	1249	1431			0429	0607	1713	1849
03	0601	0741	1728	1910	0246	0427	1238	1419			0456	0635	1739	1917
04	0719	0859	1707	1847	0235	0416	1227	1408			0345	0523	1630	1805
05	0657	0837	1645	1825	0224	0405	1217	1357			0411	0550	1655	1832
06	0635	0815	1624	1803	0213	0354	1206	1346			0301	0438	1721	1859
07	0613	0753	1741	1923	0202	0343	1155	1335			0327	0506	1612	1748
08	0551	0731	1719	1900	0151	0332	1144	1324		1421 1611	0354	0533	1638	1815
09	0709	0850	1658	1838	0140	0321	1134	1313		1403 1553	0243	0421	1704	1842
10	0648	0828	1636	1815	0129	0310	1302	1444		1345 1536	0310	0448	1555	1730
11	0626	0806	1615	1753	0118	0259	1251	1433		1327 1518	0159	0337	1620	1757
12	0604	0744	1732	1913	0248	0429	1240	1422		1310 1500	0225	0404	1646	1824
13	0722	0902	1710	1850	0237	0418	1230	1411		1252 1442	0252	0431	1537	1713
14	0700	0840	1648	1828	0226	0407	1219	1359		1424 1615	0141	0319	1602	1740
15	0638	0818	1627	1806	0215	0356	1208	1348		1407 1557	0208	0346	1629	1807
16	0616	0757	1606	1744	0204	0345	1157	1337		1349 1539	0235	0413	1519	1655
17	0555	0735	1722	1903	0153	0334	1147	1326		1331 1521	0124	0302	1545	1722
18	0713	0853	1701	1841	0142	0323	1136	1315		1313 1504	0151	0328	1611	1750
19	0651	0831	1639	1819	0132	0312	1304	1447		1256 1446	0217	0356	1502	1638
20	0629	0809	1618	1757	0121	0301	1253	1435		1238 1428	0106	0244	1527	1705
21	0607	0747	1735	1916	0250	0431	1243	1424		1220 1410	0133	0311	1418	1554
22	0545	0725	1713	1854	0239	0420	1232	1413		1202 1352	0200	0338	1444	1620
23	0703	0844	1651	1831	0228	0409	1221	1402		1335 1525	0049	0227	1510	1648
24	0641	0822	1630	1809	0217	0358	1210	1351		1317 1508	0116	0254	1401	1536
25	0620	0800	1609	1747	0206	0347	1159	1339		1259 1450	0143	0321	1426	1603
26	0558	0738	1725	1907	0156	0336	1149	1328		1241 1432	0031	0209	1452	1630

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1997 Membership Survey

Yes = ☐ No = ☐

Which satellites are you receiving?

Polar orbiters: Wefax ☐ PDUS ☐

(Analogue) (Digital)

Geostationary: APT ☐ HRPT ☐

Are you experiencing interference? ☐ *Has it increased since last year ?* ☐

Are you involved with education ? ☐

Which topics would you like to see **more of** *in the Journal?*

.....

Which topics would you like to see **less of** *in the Journal?*

.....

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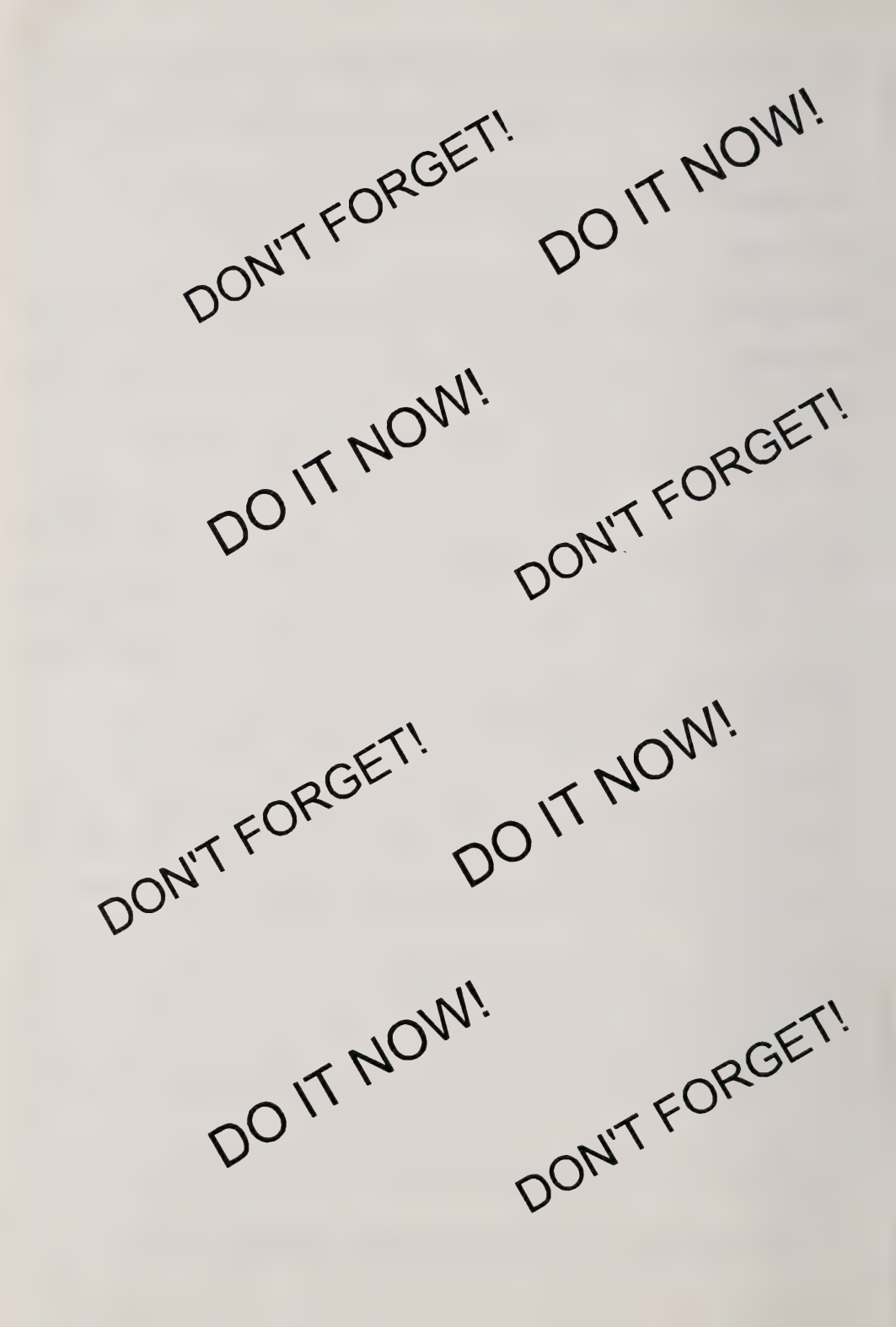
Please add any comments you would like to make (add a sheet if necessary):-

Thank you. Your information helps to guide the future of RIG and the Journal.


DON'T FORGET!
DO IT NOW!
DO IT NOW!
DON'T FORGET!
DON'T FORGET!
DO IT NOW!
DO IT NOW!
DON'T FORGET!

	NOAA 12				NOAA 14				METEOR 3-5		SICH 1			
	S′ bound		N′ bound		S′ bound		N′ bound		N′ bound	S′ bound	S′ bound		N′ bound	
27 Jan	0716	0856	1703	1844	0145	0325	1138	1317		1224 1414	0058	0236	1343	1519
28	0654	0834	1642	1822	0134	0314	1128	1307		1206 1356	0125	0303	1409	1545
29	0632	0812	1621	1800	0123	0303	1256	1438		1148 1339	0014	0152	1435	1613
30	0610	0750	1600	1738	0112	0253	1245	1426		1130 1321	0040	2330	1326	1641
31	0549	0728	1716	1857	0242	0423	1234	1415		1112 1303	0108	2356	1351	1528
01 Feb	0707	0847	1654	1835	0231	0412	1223	1404		1055 1245	0134	0313	1417	1556
02	0645	0825	1633	1812	0220	0401	1212	1353		1227 1418	0023	2312	1308	1444
03	0623	0803	1612	1750	0209	0350	1202	1342		1210 1400	0050	2339	1333	1511
04	0601	0741	1729	1910	0158	0339	1151	1331		1151 1342	0117	0256	1400	1538
05	0539	0719	1707	1847	0147	0328	1140	1320		1134 1324	0005	2255	1250	1426
06	0657	0838	1645	1825	0136	0317	1130	1309		1116 1307	0032	2331	1316	1453
07	0635	0816	1624	1803	0125	0306	1258	1440		1058 1249	0100	2348	1207	1342
08	0614	0754	1603	1741	0114	0255	1247	1429		1041 1231	0127	2237	1232	1409
09	0552	0732	1719	1900	0244	0425	1236	1417		1023 1213	0015	2304	1258	1436
10	0710	0850	1658	1838	0233	0414	1225	1406		1005 1155	0042	2331	1150	1325
11	0648	0828	1636	1816	0222	0403	1215	1355		0947 1138	2219	2357	1215	1351
12	0626	0806	1615	1754	0211	0352	1204	1344		1120 1311	2246	2424	1241	1419
13	0604	0744	1732	1913	0200	0341	1153	1333		1102 1253	2135	2313	1307	1446
14	0543	0722	1710	1851	0149	0330	1142	1322		1044 1235	2202	2340	1157	1334
15	0700	0841	1649	1828	0138	0319	1132	1311		1027 1217	2229	2407	1223	1401
16	0639	0819	1627	1806	0127	0308	1300	1442		1009 1159	2118	2256	1114	1250
17	0617	0757	1606	1744	0116	0257	1249	1431		0951 1141	2145	2323	1139	1317
18	0555	0735	1722	1903	0246	0427	1238	1420		0933 1124	2211	2350	1206	1344
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	NOAA 12				NOAA 14				METEOR 3-5	SICH 1			
	S′ bound		N′ bound		S′ bound		N′ bound		N′ bound	S′ bound		N′ bound	
22 Feb	0607	0747	1557	1735	0202	0343	1155	1335		1012	1203	2043 2221	1038 1214
23	0546	0726	1713	1854	0151	0332	1144	1324		0955	1145	2110 2248	1104 1242
24	0704	0844	1652	1832	0140	0321	1134	1313		0937	1127	2137 2315	0956 1130
25	0642	0822	1630	1809	0129	0310	1302	1444		0919	1110	2026 2204	1021 1157
26	0620	0800	1609	1747	0118	0259	1251	1433		0901	1052	2052 2231	1046 1224
27	0558	0738	1726	1907	0248	0429	1240	1422		0844	1034	2119 2258	0938 1113
28	0716	0857	1704	1844	0237	0418	1230	1410		0826	1016	2008 2146	1003 1140
01 Mar	0654	0835	1642	1822	0226	0407	1219	1359		0808	0958	2035 2213	1029 1207
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06	0645	0825	1633	1813	0132	0312	1304	1446		0829	1020	1933 2111	0928 1105
07	0623	0803	1612	1751	0121	0301	1253	1435		0812	1002	2000 2138	0954 1132
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13	0552	0732	1720	1901	0155	0336	1149	1328		0625	0815	1925 2103	0744 0919
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18	0543	0723	1710	1851	0241	0422	1234	1415		0646	0837	1823 2002	0817 0955
19	0701	0841	1649	1829	0230	0411	1223	1404		0629	0819	1850 2029	0709 0844

ANNUAL EXHIBITION AND CONFERENCE SATURDAY 26 APRIL 1997

Frank Bell

Following the successful format of the past few years your committee has decided to have another one day conference, together with an exhibition, in 1997. I had hoped that we could hold the event in the Bristol area, thus giving a balanced distribution of venues and allowing west country and Welsh members a more local event. No offers to host the event have been received so your committee has taken the decision to again hold the event at the Royal Grammar School, Guildford. The current plan is that the format of the day will be the same as in 1995 with a programme of expert speakers giving short presentations on subjects of topical interest to members.

The speakers at Chester in 1996 were outstanding and I hope this standard can be maintained in 1997. There is also a plan for an exhibition. All the main manufacturers of equipment and service providers that RIG members use will be invited to display their latest offerings. If the past track record is anything to go by the exhibition will be very popular with members. However, it must be remembered that although potential exhibitors will be invited at this stage nothing can be guaranteed; we depend on the willingness of people to turn up. Lunch will be available within the school.

A full programme and a registration form will be included in the next Journal but, for now, put the date into your diary for next year; Saturday 26 April 1997. The exact costs have not been determined but, including lunch, an attendance fee of around £10 is likely.

NOTICE OF RIG AGM 1997

Later in the afternoon of Saturday 26 April 1997, after the conference has finished, RIG will hold the 1997 AGM. Again a full agenda will be published in the next journal. In 1995 and 1996 it was very encouraging to have so many members stay for the AGM and I hope it will be the same in 1997. This organisation belongs to its members and the AGM is an opportunity not only for formal business but also for open discussion about matters relating to our hobby. Be there! ⊕

RIG*sat* IF1

Further to the image slippage problem (RIG 46 page 68), Alan Woodcock reports that using Ramdrive, as suggested by by Graham Spray, improves results but there is still some disk activity. Alan identified this as being due to JVFAX loading the mask, used with Meteosat to remove the surround, in pieces. After copying the JVFAX programme into Ramdrive Alan reports no further problems. ⊕

EXPERIENCES WITH HRPT

Sam Elsdon

Although I decided to try HRPT a long time ago, it has taken a fair time to come to fruition due to other projects which got in the way. However, a few weeks ago I decided to get down to the job and build a receiver having obtained the decoding hardware and software from Timestep.

I am very lucky to live near Les Currington who, over the years, has built and tested all manner of radio circuits and has a wealth of knowledge of what performs well and what doesn't. Before going any further, I have to say a big 'thank you' to Les for the advice given when I embarked on the project.

The receiver was built as a number of modules; namely, a) 1.7GHz - 137.5MHz downconverter, b) 97MHz oscillator module for the downconverter, c) 137.5MHz - 10.7MHz converter, d) demodulator and e) metering. These modules were mounted in a 300mm X 300mm box (which I use for most projects) along with a small power supply. A low noise amplifier (LNA) was also built to be mounted at the feed point of a Timestep 90cm dish fitted with the helical feed.

The downconverter is of the DK1VA design published in the 1/85 issue of VHF Communications. Although not the simplest design around, it is very easy to build if you have access to PCB etching materials although alignment can require a bit of patience without good test equipment. The original design was for Meteosat reception and had two oscillators on the same PCB as the rest of the downconverter. I had decided to allow room for expansion and so made four oscillators in a separate module. As the oscillator outputs are taken to a common point, loading of any oscillator by the other three was a potential problem. This was overcome by reducing the value of the oscillator output coupling capacitors. Naturally this would also reduce the output and so a MAR-6 amplifier was placed at the common point to restore the levels. If you are contemplating building a HRPT receiver, it is wise to buy a crystal for Meteosat channel 2 for use as a signal source whilst aligning.

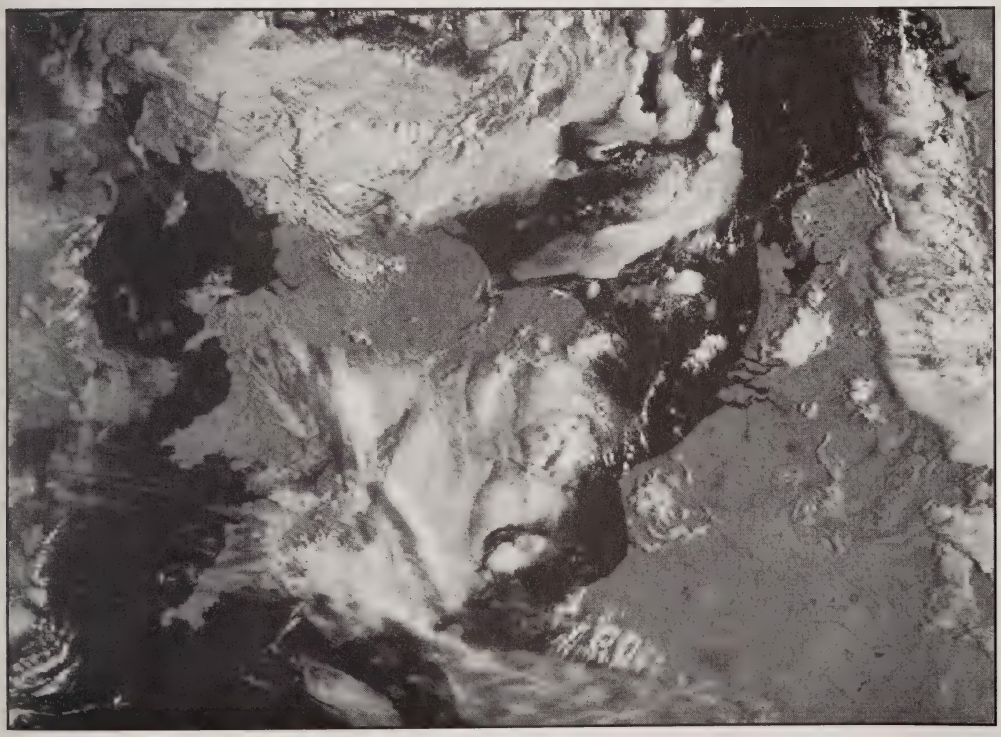
All went well with the downconverter which worked perfectly. Then, disaster struck. I wanted to avoid the problem of corrosion of the copper ground plane and decided to apply some protective lacquer. WRONG! If you gain nothing else from this article, remember not to lacquer a PCB operating at these frequencies unless you know that it has no operational effect. It killed my downconverter stone dead. In my attempts to recover the situation, the converter got into such a mess that it went in the bin and I built a new one. Be warned!

The 137.5MHz to 10.7MHz converter is a modified front end from the early version of the Cirkit weather satellite receiver. The modification is to leave out one of the

first stages and to slightly reduce the gain of the remaining stage. There was a worry that because of the receiver bandwidth, the local oscillator operating at 14MHz may interfere with the signal but this proved not to be the case.

The demodulator started out as that described variously by Jean-Claude Beneche, F1AIA, Guido Emiliani, I4GU, Marciano Righini, I4MY and Giampaolo Rossini, IW4CSG. I removed the BF900 amplifier from the F1AIA design and replaced it with an amplifier of three MAR-6 devices as an AGC strip from Plessey application note AN40 and incorporated the filter from the I4GU/I4MY/IW4CSG article. Initial testing prompted a change in the output configuration by taking the signal from the unused output on the SL1451 (pin 15) and filtering in a two stage low pass filter by John Dubois. This cleaned up the waveform considerably.

I had not intended to build a metering module but I had great difficulty in using the signals in the original demodulator for signal strength reading without upsetting demodulator operation. I therefore added a simple unit with the trusty old CA3189 providing a signal strength output.

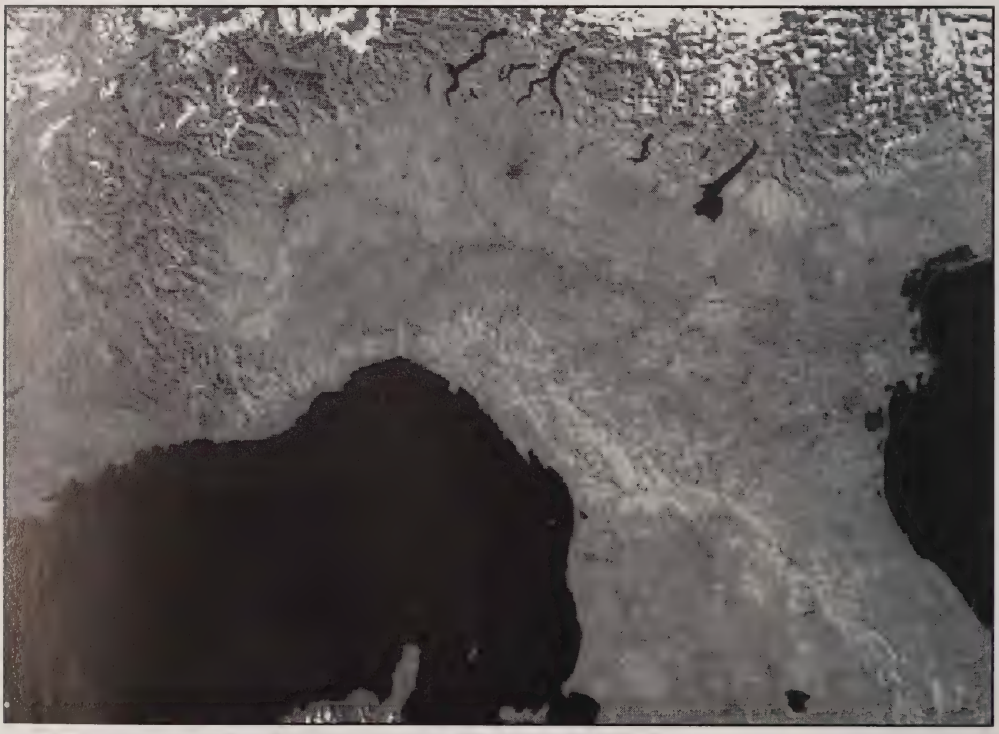


NOAA 12 Ch2. Early morning Sun over Britain.

None of the above proved particularly difficult to build and alignment using Meteosat was quite straightforward. However, when first attempting to receive HRPT, things were not so easy. Firstly, although I had the dish autotracking, it was standing on the patio until I was satisfied that the whole system was working correctly. This gave me a very limited view of the sky as the house was to the west of the dish and a tree to the east.

At first, signal strengths proved disappointing but this was due to the selectivity of the downconverter (which had been aligned for Meteosat) and a mismatch between the antenna feed and the LNA. The LNA was cured with a different coil at the input and the downconverter was simply retuned.

After trying to optimise the alignment using several passes, the output signal to the computer appeared to be too small as no images were being decoded. This was the point at which the demodulator was modified for the other output pin and the filter changed. Together with retuning a mis-aligned coil the output level increased dramatically and the computer synchronised to the signal.....briefly. With hope now in sight, I struggled to squeeze every drop of signal out of the receiver to try to



The River Po is clearly visible in this NOAA 14 Ch2 image.

maintain sync but any sync indication was short lived. It was purely by chance that whilst trying to tune for more output, I accidentally reduced the output and obtained a steady sync indication. All the time, I had been overdriving the Timestep card in the computer. On this occasion, the sync light stayed on for more than a minute until the satellite became obscured by the house. On inspecting the received image, I had an almost noise free image of southern England and Northern France. Fantastic!

Sadly, things never really improved from here. I found that the time the computer spent in sync was always very short-lived. I experienced many problems in trying to align this circuit for consistent tracking although I have seen results obtained by others which were excellent. On reflection, trying to incorporate an AGC strip at such an early stage may have been a bit ambitious.

After three weeks of trying for consistent results, I admitted defeat and built a demodulator from a sketch by John Dubois. During the construction process, I tested each stage as it was built and ironed out any snags as I went along. On completion, the improvement in ease of alignment was immediate and a very good image was obtained at the first attempt.

Over the past few weeks, I have built up quite a library of pictures but there is one tedious problem left to overcome. The phase-locked-loop in the demodulator does not cope with Doppler very well and needs to be kept centered with a coarse tuning pot. Not a major inconvenience as adjustment is required very infrequently. However, it would be nice not to have to do this so I am currently trying to solve it.

My intention had been to provide circuits of the modules for this receiver but I am still in the process of obtaining permissions to duplicate those parts that I used from other people's designs. Hopefully it will be ready for the next issue. Some initiative will be required on the part of anyone who wishes to 'have a go' (eg PCB etching) but, apart from the downconverter, there is nothing very critical in the layout.

Stay tuned! ⊕

A COMPOSITE RADAR IMAGE FROM SICH 1

Roger Peck

The image overleaf was assembled from ten separate radar images I received from Sich 1 between 23 March and 16 August 1996. Initially, I cut-and-pasted paper printouts to determine the required rotation of each individual image and where best to make the joins. The data from this exercise were then used with a graphics programme on the PC to prepare the version reproduced here. ⊕

THE METEOSAT SYSTEM - PART 3

THE EUMETSAT GROUND SEGMENT

EUMETSAT

[The second part in this series, last December, briefly outlined the new EUMETSAT ground segment but it seemed to generate more questions than it answered. Hopefully, this more extensive look at the system will answer remaining questions. Ed.]

The **EUMETSAT ground segment**, established within the Meteosat Transition Programme (the MTP was established to ensure continuity until Meteosat Second generation operations begin in 2000), consists of a number of major components at different locations. These include:

- the Primary Ground Station in Fucino, Italy, used for normal communications with spacecraft,
- a Back-up Ground Station, used in emergencies for monitoring and control of the spacecraft,
- the major communications facilities which connect the Primary Ground Station in Italy with the Mission Control Centre in Germany,
- the Mission Control Centre (MCC) in Darmstadt, Germany, where the complete system is monitored and controlled, and all data processing is undertaken.
- an up-link facility based in Lannion, France, to relay image data from satellites other than Meteosat,
- three Meteorological Data Distribution up-link sites, used to broadcast data through Meteosat,
- the Land-Based Transponder, used for orbit determination,
- reception facilities, located at user sites and under the direct control of the relevant users.

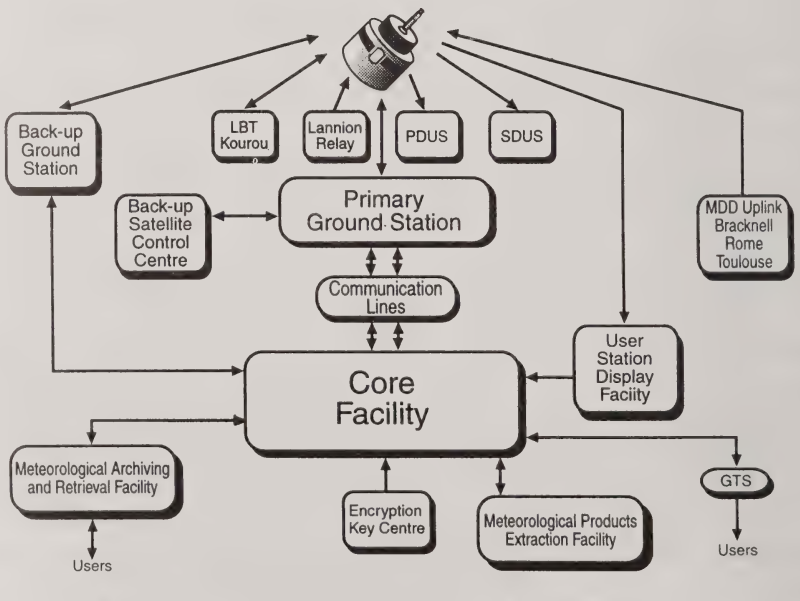
THE GROUND STATIONS

The **Meteosat Primary Ground Station** (PGS) is established at Fucino which is approximately 150km east of Rome. It is a facility fully owned by EUMETSAT, but located within a commercially operated centre which serves many satellite systems. The PGS is the main channel of communication with the Meteosat satellites and is an essential component of the Meteosat system. The separate **Back-up Ground Station** (BGS), situated in Weilheim, in southern Germany, can be used in emergencies for satellite control purposes. The PGS has the operational capability to support the main user missions, handling the raw image transmissions from the satellite mission data, and transmitting the processed images back through the satellite to the users. The PGS also uniquely supports many other mission related functions

and has the capability to act as the back-up satellite control centre in the event of severe problems at the Mission Control Centre (MCC) in the EUMETSAT headquarters, or failure of the main communications link between the MCC and PGS. To accomplish these vital tasks a considerable amount of redundancy is incorporated in the station. The PGS can function automatically and no operating staff are normally required. It has engineering support for maintenance purposes only during normal working hours, while normal operations are supervised by the MCC staff in Darmstadt.

THE MAIN COMMUNICATIONS LINKS

The two main components of the Meteosat ground segment, the MCC in Darmstadt and the PGS in Fucino, are connected by high speed data communications links to enable the necessary transmission of data between them. Two independent links are provided in order to ensure system reliability. The nominal connection is a commercial link through an Intelsat satellite. It has a capacity of 640kbps and a bit error rate better than 1 in 10^8. The two terminals for this service, including the necessary 4m antennas, are located directly at the EUMETSAT Headquarters and at the PGS.



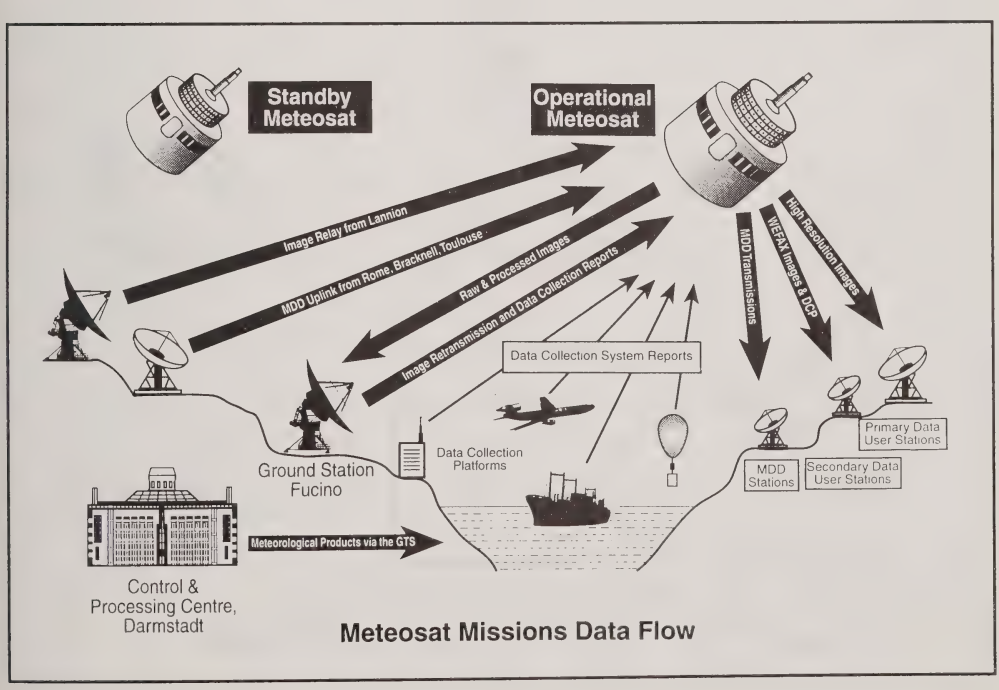
EUMETSAT Ground Segment Architecture

The second link is established for back-up reasons and is implemented over terrestrial lines, with the same capacity as the space link and a bit error rate better than 1 in 10^6.

THE MISSION CONTROL CENTRE

The Mission Control Centre (MCC) is a dedicated facility incorporated in the operations wing of the EUMETSAT headquarters building in Darmstadt, Germany. Dedicated communications links connect it to the Primary Ground Station in Fucino and to the Back-up Ground Station in Weilheim. The MCC is the core of the Meteosat ground segment. The entire system is controlled from the MCC and this is where all of the central processing is conducted. Facilities are installed for the monitoring and control of all the main components of the Meteosat system, including the spacecraft, the primary ground station, the main communications links and the MCC itself. Additional facilities are used to generate meteorological products from the Meteosat image data, to archive the images and products, and to monitor the end-to-end performance of the system from the point of view of an end user.

At the EUMETSAT headquarters in Darmstadt, the MCC comprises the following facilities:

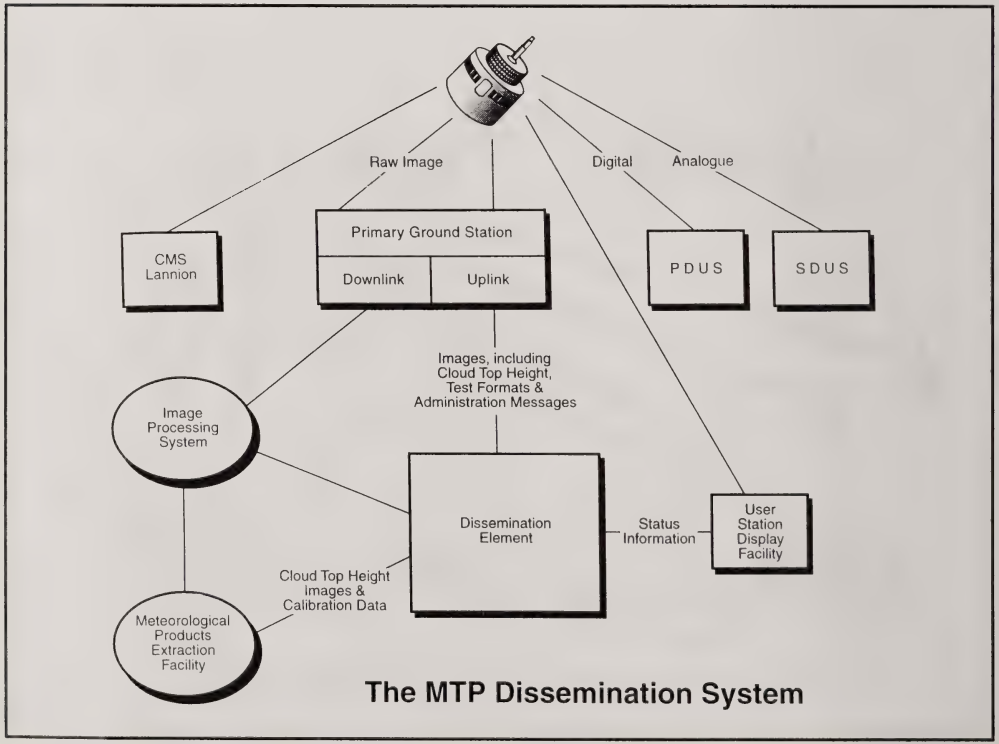


Meteosat Missions Data Flow

The Core Facility

The core facility provides monitoring and control facilities and also performs image processing, dissemination, and the central tasks of the Meteosat data collection system. The facility is based on networks of powerful computer workstations interconnected through high speed local networks. There are two independent processing chains, each capable of supporting the processing load from one fully operational spacecraft. In addition there is a development system, used to test enhancements. This system can also be used as a back-up configuration. The main system incorporates 26 operational workstations which can be used to keep two spacecraft in operation and maintain a third in a hibernated state.

The total computer processing power is substantial, actually exceding the mainframe based systems which it replaced. The system is arranged in a flexible way and can be readily reconfigured in case of need. Due to the modern flexible technology there is no need for a permanent shift of computer operators, the facility being operated by a shift team of two controllers: a satellite controller and a ground segment controller.

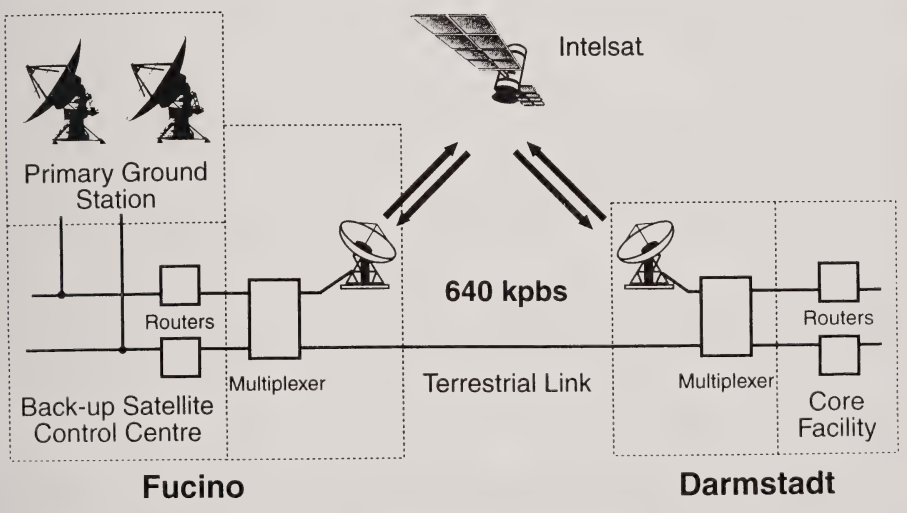


The MTP Dissemination System

Monitoring and Control

Meteosat monitoring and control functions are executed within the core facility on a series of linked computer workstations, each supporting standard display facilities used by the human operators. The information is displayed graphically, using multiple display windows on one screen to provide the maximum amount of information in the most effective way. Display windows can be selected according to the focus of activity at any one instant and can easily be re-mapped or duplicated to other monitors to ensure the maximum flexibility of operation.

The basis for the activity is the mission operations plan which governs the routine cycle of operations and is monitored using the display consoles. Routine spacecraft commands are stored in the computer system and transmitted automatically in accordance with a pre-defined schedule. Non-routine commands are transmitted in accordance with pre-defined procedures. The transmission of the command sequences and the telemetry from the spacecraft are all displayed on the consoles, colour coded according to the status of the activity or result. Some hundreds of parameters are monitored for each spacecraft and, where any parameter exceeds pre-defined thresholds, an audible alarm is sounded and the parameter shown in distinctive colours.



The transfer of data between the Primary Ground Station and the Core Facility

The configuration of the spacecraft and of the ground segment can also be monitored on the display screens. The graphic displays show which of the redundant components are in active use and which are available in stand-by. The system permits re-configuration of both the spacecraft and the ground station under software control from the consoles. This enables remote operation and control of the Primary Ground Station in Fucino.

Image Processing

Apart from the control function, a primary task of the core facility is to process Meteosat image data in real time. Raw images are received via the Primary Ground Station and processed line by line to remove image imperfection. In particular, the data from the various on-board sensors are re-aligned by re-sampling in order to make the image from each set of detectors coincide with the other images. At the same time, the sampling removes the slight perturbations caused by the movement of the spacecraft, thereby rectifying the image so that it appears to come from the nominal location of the spacecraft. Adjustments to the individual data values are made according to calibration information, then the image is passed to the dissemination computers for immediate relay to users and to the meteorological computers for further processing.

Image Dissemination

The dissemination of Meteosat images is also prepared in the core facility using dedicated workstations. Processed images are cut into individual formats, which range in size from the full earth disc to segments covering Europe or smaller areas. These formats are prepared according to a pre-defined schedule for the two Meteosat dissemination channels and sent back via the communications link to Fucino for uplink to the spacecraft and thence transmitted to the users. The aim is to make the processed image data available to the users with the minimum of delay. Priority is given to the European sectors, for which the processing is completed and dissemination started within three minutes of the completion of image acquisition. Transmission of the image covering the full earth disk starts four minutes later and the full earth imagery data are normally fully available on the users' computer systems within a maximum of 20 minutes from the completion of image acquisition.

Meteorological Products Extraction

The Meteorological Products Extraction Facility (MPEF) receives rectified image data from the image processing system and derives from it a range of meteorological products for the end users. The facility includes processing chains which can simultaneously support operational product extraction and provide support for satellite commissioning. Additional capacity is provided for supporting the testing and de-

velopment of new algorithms and products.

The product derivation takes place in near-real time as the image is received. Eight different products are generated:

Cloud Motion Wind	Sea Surface Temperature
Cloud Top Height	Upper Tropospheric Humidity
Cloud Analysis	ISCCP Data Set
Precipitation Index	Climate Data Set

The facility is also responsible for determining the absolute calibration of the Meteosat radiometer spectral channels and this information is passed to the core facility for inclusion with the dissemination of high resolution images.

Products are generated automatically under the control of a schedule and are quality controlled before being distributed to the users. The quality control can be performed manually or, for some products, by using elaborate automatic procedures. During these processes the products and images can be displayed for analysis on sophisticated workstations.

Archive and Retrieval Facility

The Meteorological Archive and Retrieval Facility (MARF) includes dedicated computer systems for receiving the image data from the core facility and the MPEF and archives all data on digital optical disks. Equipment is available to provide images to users in both digital and photographic form in a variety of formats.

All Meteosat images and derived meteorological products generated are archived on optical disks. Similar data from all previous Meteosat satellites will also be transcribed onto optical disks as part of an on-going process. Eventually the digital archive will contain over 20 years of data commencing with images from the first Meteosat launched in 1977.

In addition to the digital data, a selection of image negatives is also maintained and both are catalogued electronically. Users may place orders by post or fax for data which can be supplied on a variety of magnetic media. Also, with the aid of a computer connection, the archive catalogue can be remotely searched and orders placed directly.

The facility also maintains an electronic bulletin which can be accessed by registered customers to obtain the latest news about the spacecraft, products and services provided by EUMETSAT.

User System Display Facility

The dissemination of processed images is the primary function of the Meteosat system and is expected to be accomplished strictly according to a pre-defined schedule matching user requirements. The operation of the central mission is monitored by the core facility of the MCC. The reception of images disseminated via Meteosat is monitored from the User System Display Facility (USDF), co-located with the core facility. The USDF has its own antenna and receiving system, together with a system of four image display workstations, so that independently monitor the final results of the image dissemination system. The received images from both communications are displayed on monitors and are used as a final check on quality. The details of the received data are also monitored by the USDF computers and passed back to the core facility for analysis and comparison with the transmitted data. By this means the ground segment controller can at any stage, be aware of any problem in the complete system and take immediate action to rectify the situation.

THE UPLINK FACILITY IN LANNION

The satellite facilities owned and operated by Météo-France in Lannion, France have been associated with the Meteosat system since the start of operations in 1977. EUMETSAT provides and maintains the facilities at Lannion for the relay of image data from satellites other than Meteosat. The primary requirement is to relay images covering the western part of the Atlantic and the Americas. These images are obtained from the USA geostationary satellite known as GOES-E, which is usually located at 75 degrees West longitude. A large antenna at Lannion receives image data directly from the GOES-E satellite at hourly intervals. The images are then reformatted on the Lannion computers into the same format as the normal Meteosat imagery and then transmitted to the users through the Meteosat spacecraft, exactly as if the transmission was of Meteosat imagery.

Images from the GMS satellite of Japan, located at 140 degrees East, are received in Lannion using conventional communications systems at three-hourly intervals, and also uplinked to Meteosat as if they were Meteosat images. Similar arrangements will be established for geostationary image data over the Indian Ocean, once an operational satellite is on station there.

By this means Lannion contributes an essential feature of the overall Meteosat system. The Meteosat user station needs only a single antenna and receiver to receive frequent images covering most of the world. This capability is vital for checking the analysed fields of global numerical prediction models used in operational weather forecasts. It is also vital for aviation meteorology, since the images can be used for briefing pilots starting the long intercontinental flights which now span half the globe without stopping.

METEOROLOGICAL DATA DISTRIBUTION UP-LINKS

The Meteorological Data Distribution (MDD) mission is a contribution by EUMETSAT to the Global Telecommunications System of the World Meteorological Organization (WMO). Its purpose is to distribute vital meteorological data to WMO members, particularly in those regions of the world where conventional communications are inadequate. MDD consists of four independent dissemination channels on Meteosat, each of which can transmit data at 2,400 bps, together with the corresponding up-link stations. Three up-link stations have been implemented by EUMETSAT at centres where meteorological data are readily available. These stations are located in France, Italy and the UK, in the meteorological centres in Toulouse, Rome and Bracknell respectively.

Each of the up-link stations has a transmitter and antenna system and operates autonomously, transmitting meteorological data according to a centrally agreed schedule. The MCC can monitor transmissions and can also initiate test transmissions through the Meteosat PGS but is not otherwise responsible for the routine operation of the MDD up-links.

THE LAND-BASED TRANSPONDER

The Land-Based Transponder (LBT) is part of the system used to determine the position of the satellite in orbit by means of ranging operations. Ranging signals transmitted from the PGS in Fucino are transmitted by the satellite back to the PGS (this is known as two-way ranging). The LBT can also receive the same signals and send them back to the PGS via the satellite (four-way ranging). The precise timing of these sequences is established at the PGS and transmitted to the MCC for use in orbit determination. A series of such measurements, normally made at three-hourly intervals, is needed to establish accurate orbit information. The LBT consists of a parabolic 4.6m antenna and an equipment cabin, designed for continuous unattended operation in a tropical environment. It is located in French Guiana.

USER RECEPTION SYSTEMS

In order to make use of the Meteosat systems, the user has to obtain the necessary reception systems. Images can be received on either Primary Data User Stations (PDUS) or Secondary Data User Stations (SDUS). Acquisition of information from the Meteorological Data Distribution mission, or the DCP Relay System (DRS), requires specific reception systems. More than two hundred PDUS and nearly two thousand SDUS are in operation, while there are nearly 100 MDD and DRS terminals in total. Data Collection Platforms for which there are many commercial suppliers, are also a user responsibility. There are about 1,000 of these facilities in operation and they are entirely the responsibility of the respective users. ⊕

JAN MAYEN ISLAND AGAIN

This Okean 4 image was received by George Swinton at 1720UT on 16 January 1996. Can anyone explain the interesting pattern to the east of Jan Mayen Island in this 9.5GHz radar image? Although the sea west of the island was largely frozen, the sea east of the island is generally ice-free, even in January. The edge codes have not been trimmed off to enable an idea of scale to be gained. During each one minute data block, the satellite travels about 400km. Either the pattern is on the sea surface or in clouds. Any ideas? ⊕

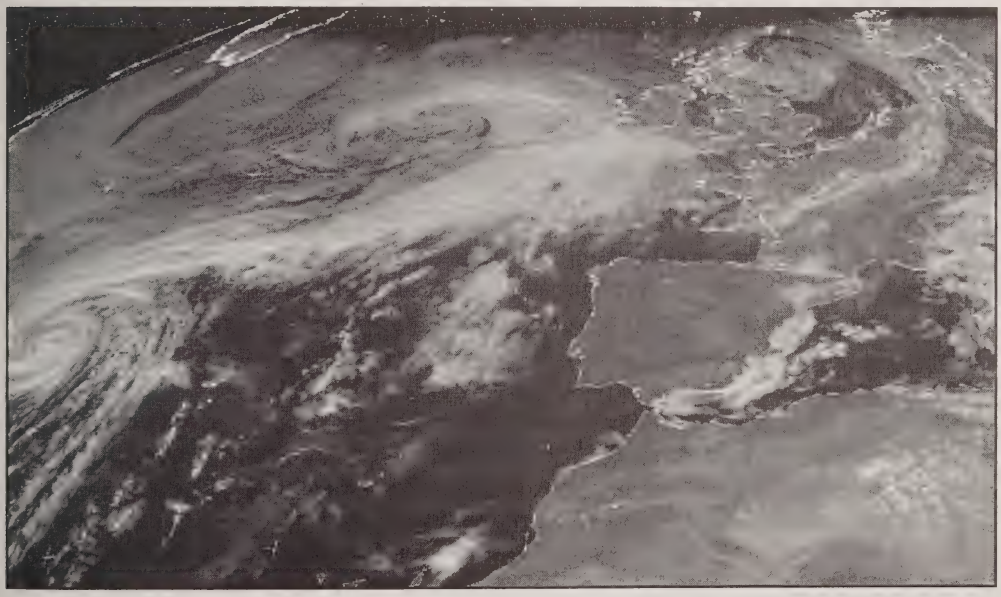
Okean 4, 1720UT 16 January 1996. Jan Mayen Island.

HURRICANE LILI

Tropical Depression Twelve developed to the southwest of Jamaica on 15 October 1996 and initially moved slowly northwest. It soon reached tropical storm force, became Lili and turned north then northeast towards Cuba. It reached maximum intensity, well above hurricane force, as it was crossing Cuba on 18/19 October.

The front cover image from NOAA 12 is timed at 1215UT on 18 October, soon after sunrise, and shows remarkable cloud detail in the hurricane's northwest quadrant. This multispectral image, courtesy NOAA/NESDIS, was made using channel 1 as the red component, channel 2 as green and the thermal infrared channel 4 as blue.

After causing widespread destruction in Cuba, Lili continued to move on a north-easterly track. A week later it was still packing in sustained winds close to 100km/hour as it passed the Azores Islands. This Meteosat 5 image shows Lili near to 42N 35W at 1200UT on 26 October. The intensity declined as Lili passed over colder water and by the time she crossed the British Isles 4 days later, there was nothing left but an average autumnal gale and some much needed rain. ⊕



Meteosat 5 1200 UT 26 October 1996.

FOR SALE: 386SX 40MHz motherboard, no memory; Amstrad 2400bps modem with software; 40MB hard drive; 5.25" floppy drive; I/O card, 2 COM ports+Games+printer with data; 4-way switch box- 4 switchable leads into 1 COM port. £50 the lot plus postage. Paul Adamson 01243 376594.

SHAREWARE CORNER

LES HAMILTON[e-mail: les@riglib.demon.co.uk]

I have had Internet access for 9 months now and realise its potential as a source of useful shareware. It was noted at the RIG Conference that a large proportion of those in attendance also had Internet connectivity, which is what prompts me to add my e-mail address at the top of this page. I acquired all of this quarter's new shareware from the Net and it occurs to me that many RIG members must also have encountered interesting and useful shareware that has escaped my notice.

May I propose that any RIG member with an e-mail facility, and who has shareware that could be of wider interest, drop me a short note with details of the program and the URL where it was found. Please do not send large programs by e-mail without first contacting me.

Finally, a brief observation on QPV reviewed last time. Although the software expires after 30 days, it may be re-installed from the original file as often as desired. Alternatively, register it. I did send off for a registered copy early this year but to no avail and several e-mails to the author since have been ignored. Has anyone had better luck?

PREDICT v2.5

This is a attractive, freeware, satellite prediction program from SMIS, the Russian Space Monitoring Information Support Laboratory. The program is offered as the self-extracting archive SPREDICT.EXE, which, when run, expands into a set of Windows installation files in a directory called DISK1. Installation from Windows is effected by running the SETUP.EXE file from this directory.

Although not as sophisticated as STS Plus or Tracksat, this is a highly interesting program, and I have spent many enjoyable hours exploring its features, particularly as it comes complete with extensive on-line help in English.

FODTRACK v1.8

Fodtrack is a simple DOS program from Chile, which, in addition to presenting a real-time satellite tracking screen, possesses powerful facilities for the enthusiast who wishes to control an azimuth-elevation rotator, like the Yaesu-Kenpro 5400/5600, and a transceiver such as a Yaesu FT736, Kenwood TS790 or one of several Icom radios. The latter features require the construction of interfaces for both rotator and radio, and schematic diagrams for these are included. FodTrack is free for

non-commercial use. [See Sam Elsdon's article *Automatic Tracking - An Update* in this issue. Ed]

HAMVIEW v1.1
This is the HRPT capture software used by Emiliani, Righini and Rossini for their Meteosat PDUS station [RIG 45 p33, RIG 46 p18]. Although not stated in these articles, the software also has facilities for handling APT (both 2 line per second and 4 line per second) and Meteosat WEFAX transmissions.

UPGRADE NEWS

VUPRINT v4.7e
The latest version of Vuprint is now available. One of the most popular image viewers, vuprint can also generate slide-shows and play movies and sound clips. Indeed, it is the ideal medium for preparing and displaying audio presentations of images. Among new features are the ability to read .WMF files (Windows Metafiles) and increased accuracy in reducing 24-bit images to 8-bit. Saving and printing thumbnails on 256-colour and 65536 colour displays now works properly. The current version also decodes UUENCODED files sent as e-mail attachments. Version 4.7 is particularly neat, coming as a single self-extracting file that de-archives under Windows, and deposits its three files within the Windows directory itself - no cluttering your hard drive with yet another application directory.

There is a 15-day trial period, after which Vuprint appears to go beserk, rapidly overprinting the screen and obliterating images with dollar signs (a hint to register!). But don't worry. Simply delete the three Vuprint files from inside the Windows directory and re-install for an other 15-day trial. Registration is $40, and by all accounts, is excellent value for money.

WINORBIT v2.9
No major changes to this graphical satellite tracking program but some bug fixes and cosmetic improvements. The number of satellites the program can handle has been increased and is now limited only by computer memory.

DECEMBER ADDITIONS TO THE RIG PC SHAREWARE CATALOGUE

The following shareware is offered on this quarter's compilation disk.

Disk RIG47: FODTRACK v1.8, PREDICT v2.5, VUPRINT v4.7, WINORBIT v2.9, VUPRINT v4.7.

SHAREWARE TITLE CATALOGUE

Programs requiring Microsoft Windows are indicated by an asterix (*)

Disk A-04	*Earth Centred Universe v2.0, Lunar Eclipse, Skyglobe v3.6, Skyview, Solar Eclipse Predictor, Solar System Finder.
Disk A-05	*Skymap v2.1 - Planetarium that displays and prints star charts etc.
Disk C-02	Hamcomm v3.0, JVFAX v7.0, Packet Monitor, RTTY_FAX, Satcom.
Disk F-01	CUTNOAA, DATtoPA2, JOIN-PIX, NOATIFF, CHOP, REJOIN, PCPLOT.
Disk I-05	IMDISP v7.9e, JPEG v6A32, Neopaint v3.2.
Disk I-06	*Iphoto, *Lview Pro, *Photolab v2.0.
Disk I-07	*Photovision Pro v1.1, *PDSWIN v2.0.
Disk T-05	*Logsat v3.0, *WinOrbit v2.8, *Satspy v1.0.
Disk T-06	PC Track v3.11, STS Orbit Plus v9615, Trackstar v2.15.
Disk T-07	AOS, AOSUS, Bird Dog v3.0, NOAATime, Predict, Sortneng, Spredict, Weather Satellite Tracker v4.7a, MKDATA, REAL95.
Disk T-08	Traksat v3.10, *Wpredict v2.63.
Disk U-04	Adjust Clock, BBC Time, PC Configuration v7.33, Geoclock v7.1, MSF, *RIG Index v1.23, Screen Thief v1.58, FAXCNV01, COPY2DKT.
Disk U-05	TESTD (Prosat card calibration utility)
Disk V-01	Compushow v2.04, GIFEXE v4.5, QPV 1.7c, SVGA v1.12, VPIC v 6.2.
Disk V-02	*GDS v3.1g, PVE v2.43, SEA v1.2, *VUPRNT v4.00.
Disk W-01	Weathr50, Windchill, WX-60, Weather Wizard.
Disk PSP	*Paintshop Pro v3.0 [2 disks for 32-bit version for Windows-95].
Disk GWS	*Graphic Workshop v1.1U, [Windows 95 version available on request].

Disk Belmont *Belmont Image Technician (sophisticated image processing suite).

If you require more information about any of these shareware programs, please consult the program RIGSWCAT.EXE which appears on Disk U-04 and all others where space permits. In addition to giving full details of each item, the program also features a search and find facility.

HOW TO OBTAIN COPIES OF THE RIG SHAREWARE LIBRARY DISKS

There is a despatch fee of £2 per order, which covers up to 6 discs (ie **not** £2 per disk). Send up to a maximum of 6 formatted 1.44 Mb MSDOS 3.5" disks per request, to Les Hamilton, 8 Deeside Place, Aberdeen AB15 7PW, Scotland. You may, of course send more than one order if you require more than six disks. The six disk limit ensures that packages will be accepted by my letter-box, and saves my travelling miles into town to pick up oversize packets at the Head Post Office. Disks must be sent in a sturdy, re-sealable package such as a padded Jiffy bag (or a package within a package). Each separate request must be accompanied by:

i) a self-addressed adhesive label
ii) stamps for the return postage
iii) coins (or additional postage stamps) to the value of £2.

No fee is asked from overseas members, although an exchange of shareware or interesting satellite images is always welcomed. Any RIG Member coming across any new or updated version of a useful item of shareware is encouraged to send it to me at the above address. Should you experience any problems running any of the shareware from the RIG Library, please enquire by letter or e-mail, and I'll reply by return.

MEMBERS' ADVERTISEMENTS

Members may advertise surplus equipment etc. for sale in the journal free of charge but subject to space being available. Advertisements should be concise and must pertain to RIG activities. They should be sent to the journal editor.

FOR SALE: 1m aluminium dish, 1.7GHz dipole feed and bracket for mast. Martelec MSC30 DCV, MSR40G RX, MSK30 VHF preamp. Together with Omnifax expansion board and cables. £450. To be collected from CR Davies (Bournemouth) 01202 514078.

FOR SALE: Complete kit of parts for RIGsat RX1, RX1a and IF1 includes cases and all hardware, partly assembled. Little work needed to complete. £78ono. Tel Malcolm 01489 577033 evenings.

MEMBERS' LETTERS

Dear Peter,

IF1 JVFAX Interface Unit - Design Fault

Having purchased, assembled and tested two of the above pcb boards, I was not satisfied with the results. The problem was traced to the output of the full-wave rectifier/averaging filter which, although varying in dc level in sympathy with the 2400Hz input signal, had superimposed on it a significant fw rectification ripple which markedly limited the dc swing. Examination of the circuit design showed that the value of capacitor 11 given as 220pF on the accompanying circuit was too small to be effective. The purpose of this capacitor is to convert the full-wave precision rectifier output from IC2C into that of an averaging rectifier with IC2D acting as a low-pass filter, whereby the output at pin 14 of IC2 should be a ripple-free dc voltage, the level of which should rise and fall between circa zero volts and peak input voltage.

The value of C11 is determined by the formula CR=1/f where f is the input frequency to the fw rectifier, ie 2400Hz and R is R21 whose value is 560kohm. CR is, in fact, the time constant of the parallel combination C11 and R21 and for best fw rectifier performance this should be made to be much greater than the time period 1/f. In my case I opted for a value of C11 based on 3 x (1/f) which works out at 2200pF and not 220pF as shown in the circuit. A zero has been lost somewhere.

Substituting 2200pF for C11 dramatically cleaned up performance, giving a clean dc voltage swing of about 7V into the A/D converter circuit. The unit now behaves as intended by the designers who are to be congratulated for making available to RIG members a functional JVFAX interface unit at a price to suit the pocket.

Sincerely, E Chicken MBE, BSc, MSc, CEng, FIEE G3BIK

Ray Godden replies:

1. *It is not a design fault.*
2. *The value of C11 was determined as a compromise between ripple level and frequency response. I built a test facility to check the resolution performance; the principle components were a modulator and an analogue to digital converter. The modulator was driven with a 2.4kHz carrier and a variable frequency signal input to simulate the image modulation. The A/D output was monitored by an oscilloscope. Component values, including C11, were optimised to shape the bandwidth, minimising aliased noise components, whilst preserving*

maximum response at the highest modulating frequency (about 1.4kHz). A better response would result from more complex filtering but this would require another operational amplifier and other components. Note that C7 with its associated resistor network provides additional attenuation of the ripple component.

3. The range of the IF1 A/D converter is set so that peak white (digital 255) can be obtained even in the presence of the ripple.

4. Both the sample-and-hold and the A/D are synchronous with the signal so are not affected by the ripple.

5. Presumably Mr Chicken's problem was that peak white could not be reached with the signal output from his receiver. In these circumstances it would be preferable to increase the value of R3 rather than change C11. With the design value of 100k and the black level set to digital zero, about 100mV results in digital 255. If the black level is set down to increase image contrast an increase will be needed. It is possible that if the black level is set well down then level will not be reached even if gain is increased. In these circumstances the A/D converter sensitivity can be increased by reducing the value of R12.

6. Incidentally, some have commented that there is some signal compression resulting in crushed whites. I have plotted digital output vs signal level and the plot is perfectly linear within the measurement limits.

7. I do not recommend that the value of C11 be changed but anybody is welcome to try it and any other modification and tell us the result. All feedback about RIGsat projects is welcome!

Dear Peter,

RIG LNA Modification

I have just built and tested the RIG LNA and obtained the following measurements with no optimization. I found them slightly disappointing as my own design of LNA using one Fujitsu FHX035FA and a MAR-6 gave 28dB of gain and a NF of 0.85 at 1.7GHz: Vds 1 & 2 = 4.75V; Ids 1 & 2 = 5.2mA; Gain @ 1.7GHz = 25.67dB; NF = 1.65dB. Total supply I = 30mA.

I couldn't help noticing the strange bias resistor values; namely 10 ohms. If you assume a wanted bias current of 10mA and a drain Voltage of 2V, then the resistor should be 5-2/10mA, ie 300 ohms less the 51 ohms chip resistors; 249 ohms. I therefore fitted a 220 ohms resistor to each drain (in series with each 51 ohms).

The theoretical method for calculating the Rs resistor is as follows: Assume Ids =10mA and data sheet value of Vp (pinch off voltage) & Idss (Saturated drain current @ vgs =0V) at -0.8V and 35mA respectively then Vgs = Vp*(1-SQR(Ids/Idss)).

Entering the numbers gives -0.43V for 10mA Ids. Therefore the required Rs = 0.43/10mA = 43ohms or 51ohms across the 220 ohms resistor.

To adjust the drain current, I adjusted Rs until 2V was measured on each FET drain by connecting a 100 ohms multiturn cermet across each 220 ohms resistor. Because of device variations, the following resistors were fitted across the 220 ohms resistors; a 91 ohms resistor was fitted across the first 220 ohms and 56 across the second.

The new LNA measurements gave the following: Vds 1 & 2 = 2.1V; Ids 1 & 2 = 10.5mA; Gain @ 1.7GHz =34.46dB; NF = 0.85dB. Total supply I = 41mA.

I found that the NF at 1.8GHz was only 0.60dB so I added a small amount of series inductance, ie 3mm of wire, to L2 to increase the overall inductance of L2. The gain and NF were now 35.3dB and 0.60dB.

The above method of adjusting the Ids of each FET makes it a lot easier and safer way to optimise the LNA. However, care should be taken to ensure that the pot is connected such that it presents 100 ohms across the 220 ohms and not a short circuit!

Sincerely, John Silver john@odyseus.demon.co.uk

Dear Peter,

Re: Cure for Pager Interference, RIG 46 pp 39-57.

In theory, it should be possible to null out any constant signal within noise limits. I fear that Hugh Pearson's comment half-way down page 44 is incorrect. Any *linear* combination of input signals will be another sine wave of different phase and amplitude. If complete nulling is not possible, then the problem must be one or more of:

a. time-varying phase and/or amplitude difference between interfering signals at 2 antennas (ie multi-path interference).
b. non-linearity (eg inter-modulation/cross-modulation) in the combining unit.
c. signal or interference leakage around the unit.

The most likely would seem to be a., ie multipath interfering signals. Possible indicators might be more interference under some atmospheric conditions such as wind or rain. This might be reduced by co-locating signal and interference antennas as far as is possible and also by playing around with with different antenna patterns for the interference antenna.

Possibility b. could be checked by introducing attenuators into both aerial feeds before the combiner. Possibility c. would probably give rise to a number of different

combinations of phase/amplitude settings for an almost null.

Probably the simplest diagnostic would be to listen to the residual pager signal at the combiner output without a satellite using, for example, a scanner. Multipath might be expected to give a rushing or changing signal depending on rain or wind. Inter-mod and cross-mod would probably be detectable by harmonics, ie a change in the pager sound and c. by 'jumps' in the signal as the amplitude/phase is varied.

Yours, Alistair Dunlop, G71ET, High View, Milton Av, Badgers Mount, TN14 7AY.

Dear Peter,

Can you please tell me if anyone has ever received low-resolution images from NOAA or Meteor satellites which capture other orbiting spacecraft such as Mir or the Shuttle?

The reason I ask is because, last night, we were given a talk about amateur and weather satellites at our local radio club here in Mansfield. It was really interesting and the speaker showed a NOAA image containing a light speck which he claimed was the Mir space station passing below the NOAA satellite. I find this very hard to accept although I have been receiving images for less than a year and have never recorded any other space vehicles on the images.

I would have thought that with the relative speeds involved and the way the scanning system works it would bevery unlikely for the speck to be Mir. I hope you can throw some light on the subject.

Malc Taylor, 56 Newgate Lane, Mansfield, NG18 2LQ.

Editor's comment:

I think it impossible for a NOAA spacecraft to image Mir - even the higher resolution HRPT. The arithmetic shows why. From 800km each NOAA pixel (HRPT) is about 1km square. As Mir orbits at about 400km, each pixel of a NOAA image would be about 500m square at the minimum distance of Mir. The size of Mir is such that at that distance it would occupy a tiny part of one percent of one pixel.

Also, not only would Mir have to cross NOAA's scan line, it would have to occupy the pixel in the line that NOAA was imaging at the time - and there are over 2000 pixels in a line scanned in one-sixth of a second!

NOAA satellites are in 98 degree inclination orbits and Mir is at 51.6 degrees. Therefore, the

relative velocity of the two craft can never be less than about 4km per second and can be as high as about 13km per second.

There is one situation where a weather satellite could image another man-made space object which has intrigued me for more than 20 years. When Meteor satellites are launched, the final stage rocket goes into a very similar orbit to the payload as they are separated by a spring. The relative velocity is under one metre per second. As the release of the spring's energy pushes the satellite forward, it enters the higher of the two similar orbits. The rocket in the lower orbit will travel slightly faster and eventually catch up and pass underneath the satellite. So, in theory, with the rocket only a few hundred metres below the imaging satellite and with a very low relative velocity, the rocket could conceivably be visible on several successive scan lines.

I have never witnessed this phenomenon but have not given up hope yet. Unfortunately, the springs used are too weak. With the Meteor 3 series, the relative velocities are so low that, in the case of Meteor 3-5, it took about three years for the rocket to gain one orbit on the payload. During this intervening period, other perturbing forces were in action and the rocket passed well to the west of the satellite when it did eventually catch it up and thus could not have appeared in the field of view of the imager.

Dear Mr Wakelin,

In RIG 46, Graham Spray discussed a problem with picture slippage when using JVFAX. I can offer a couple of tips which together cured this problem for me.

Ensure that the computer's disk controller is correctly configured for the fastest access time compatible with your hard disk. (Back-up your data before experimenting with different settings!). On my PC the disk controller has jumpers to select the access time and the computer supplier had left them set to a much slower speed than that of the hard disk.

Keep the hard disk unfragmented (by using DEFRAG regularly with the 'Full Optimisation' configuration option selected). I now keep a separate partition on my hard disk for satellite images; then I need only keep this partition unfragmented to ensure slippage-free reception.

Yours faithfully, Roger Peck, 71 Hoynors, Danbury, Chelmsford, CM3 4RL

Dear Peter,

"For hobbyist users to expect to be able to pull perfect images out of the sky for

almost no financial outlay is, in my opinion, quite unreasonable..."

It was this statement of yours, in reply to a letter from Graham Smith (RIG 46, page 86), that answered a question that had long troubled me. Why am I no longer very interested in receiving satellite images? I think the reason is that it is all too easy. Just throw money at it and the next day you can be receiving perfect images out of the sky!

I first saw pictures from out of the sky in 1947 when my uncle, recently returned from overseas, turned a bit of army surplus equipment into a TV. I still remember being shown a picture of the Cenotaph service, some two inches square and upside down! Later, like most, I built crystal sets using fuse wire cats' whiskers and coke-like crystals to hear the Light programme on my army-surplus headphones.

As a radio amateur, my first top band receiver was home-brew and regenerative! My first commercial set was a Codar costing about ten pounds. The hobby was financed from pocket money.

I first read of satellite pictures in the Shortwave Magazine and I saw the equipment being demonstrated (by John Tuke?) receiving pictures from ESSA 8, at a Mullard exhibition in London but I forget when. An article by Gerry Kennedy in Wireless World led me to receiving my first pictures using a converted FM radio strip from Henry's Radio costing a fiver, an oscilloscope with a large capacitor on the Y input, a free running timebase with the audio modulating the Z. A camera with the shutter on B recorded the picture line by line. Not sophisticated, but cheap and exciting.

Using a surplus radar tube and circuits from a series of articles in 73 magazine by John Taggart, I built a more sophisticated machine and viewed images in a darkened room from NOAA 5. At this time I met or corresponded with Les Currington and Mike Christieson who were both experimenting in this new field. I also received calls from Geoff Perry but he always wanted the edge-codes and not the pictures!

Fax machines were becoming available on the surplus market via John's Radio and yes, I had one of these for a while- I captured my first Meteosat picture on one. I had a call recently from someone who had "my" machine! These were devils to set up and slope detecting the FM signal helped stretch the greyscale.

When the BBC computer came along it was not long before there was a program, written in basic, to display a picture. This had a four-step greyscale but the pictures were recognisable. I wrote a despeckle program to remove the interference by comparing each pixel with its neighbours and it cleaned up the pictures. Around this time I first met Dave Cawley and we both sat in my shack watching while Mike

Treadaway wrote machine code, on the fly, to display a NOAA picture on a Research Machines 380. The first few lines went from right to left but a few changes to the code cured this.

Framestores - I built one of those with Les Currington's help from pocket money and by the time it was running you had certainly learned everything about digital circuits.

Then came the PCs and the satellite cards and software. It all became too easy. Like satellite TV; buy the box, plug it in, and look at the pictures- the excitement has gone. So I suppose the editor is right when he says

"For hobbyist users to expect to be able to pull perfect images out of the sky for almost no financial outlay is, in my opinion, quite unreasonable..."

We live in the days of plug-and-play. So play we may, but the excitement of receiving those first pictures from space on homebuilt equipment costing nothing but time and thought are gone and the hobby, for hobby it is, is the loser.

Terry Weatheley, Carlton Colville, Suffolk.

Dear Peter,

I found the views expressed in the letter from Graham Smith (RIG 46, p86) and your comments very interesting. With respect, Peter, I would disagree with you about not "sticking with the present 20 year old analogue system" because I understood that that the general aim of NOAA was that a system should be available which *is* simple to use. As Graham points out, if we go for a higher resolution system on 137MHz with its wider bandwidth, the pager problem can only get worse than it is already - another good reason for keeping the lower definition system going.

As APT *users* do we need a technical challenge? I sometimes think RIG members overlook the real aim of APT images. No one likes better than I to see an excellent picture on the screen with the highest possible resolution available from the system but the real point of the images is to help interpret the weather situation, not to try to see the course of the River Thames or smoke trails from ships, interesting though these observations may be in themselves. The origin of the whole idea of weather satellites was to observe the formation of hurricanes in the West Indies region and the present system is quite capable of showing all major and quite a number of minor weather features. I think you will know that I am happy to have challenges from time to time but I do not need them for my daily weather observations which are adequately covered already.

Those members who were interested in the weather satellite business in the mid-sixties may recall that I received considerable publicity and enthusiasm from NASA and GEC simply because I had shown that images *could* be received on simple equipment that did not cost thousands of pounds which was the general opinion at that time. Surely there is nothing wrong with that basic idea today.

Yours very sincerely, John Tuke (G3BST)
Spring Cottage, Pains Hill, Limpsfield, RH8 0RG.

Editor's comment:

Only the two readers above took the bait I laid to try to liven up the Letters pages. I, too, can reminisce about the "good old days" but as a ***user*** *of satellite images since the early 70s my recollections are somewhat different. Like missing images because creepy-crawlies got into the cosy environment of the Eddystone receiver and having to call out a technician to extricate a lizard-shaped block of charcoal. Missing images because the helix in those awful fax machines, so liked by Graham Smith, snagged the damp paper. Terrible stuff that moist, electrosensitive paper was. After years in use it was found to contain a possible cancer-inducing substance and when dry was a serious fire hazard. Its shelf life, even when correctly stored was very short too, and rarely gave more than a few shades of grey. No! give me the easy, reliable, all-on-a-single-chip modern stuff any day.*

It is true that very high resolutions are not needed for most meteorological applications but many other uses, not envisaged when HRPT began, have been found for 1km resolution data. EUMETSAT recently announced a big expansion of its training programmes, especially in Africa, so that the poorer, emerging nations can benefit. Now that 1km data are technically feasible on 137MHz, is it right to deny the benefits of these superior data to poorer nations just so that hobbyists can get interference-reduced images?

Ascot, where I live, is no longer the semi-rural paradise it once was and there is plenty of interference on the APT frequencies but it does not spoil my images at all. Rather than suffer interference, I chose to "throw money at it" and get a rotator and 5X-Y antenna. Thus my receiver listens to only a small part of the sky which rarely includes an interference source unlike an omni-directional antenna which continuously hears all the interference around the horizon. Surprisingly, the RIG shop sells a dozen Turnstiles for every 5X-Y antenna. Sure, if I had the knowledge, inclination, ability and spare time, I might have built something along the lines of the project described by Messrs Pearson, Stevens and Day in the last journal, provided I could convince myself that it would work with other than a single interfering source. As I have none of these, I have to buy equipment but as my interest is solely in the images, this in no way detracts from the hobby for me.

In the Membership Secretary's report in this issue you will see that fewer people indicated

radio technology as their principle interest compared with both meteorology and Earth observation so electronics is not everything for all RIG members.

Weather satellites are not amateur satellites but you can, of course, make them your hobby, spending as little or as much on it as you wish. However, I do not think the Chief Executive of the UK Met Office would be very pleased if he was told he could not have his new Advanced Microwave Sounding Unit on the next generation craft because bigger, heavier batteries have to be fitted so that hobbyists can have a stronger signal.

Dear Peter,

I read with great interest the articles by Hugh Pearson and Barrie Stevens on curing the 'pager plague'. As with most experimental systems, they are very close to the final answer but perfection is proving elusive.

I can observe the presence of pagers on my APT and HRPT receivers but, since they cause me no problem, I did not build the system described. However, I decided to make a few measurements and see if anything struck me as potentially useful to Hugh and Barrie.

Being fortunate enough to own a decent spectrum analyzer, I had a look at the paging band in my area and found four signals - one each on 137.975MHz and 138.075MHz and two on 138.175MHz. I presume that on the higher frequency I am seeing signals from adjacent zones. In the articles, I recalled reference to 'the pager' and then wondered if our intrepid experimenters had assumed that they were working with one paging signal whereas there may be several. Admittedly, the difference in wavelength between the highest and lowest signals I can see is only 3.2mm which is only 0.15% of one wavelength at the highest frequency. It sounds insignificant and probably is but I wonder whether it may contribute to degradation of the phasing aspect of nulling.

What most definitely is significant is the difference in amplitude between the signals, particularly the two on the same channel where the difference is 15dB. The minimum amplitude difference between any two signals is 4dB.

I could find no mention in the articles about whether the success of nulling varied during each paging burst so I measured the summed effect of the four carriers in the receiver IF with a sensitive RF voltmeter. As one may expect, a number of signal amplitudes (theoretically 15, allowing for when they are all off as being the 16th) were observed during a short space of time. Of course, in an ideal situation, the sum of the interfering signals on the crossed dipoles would be the same as the sum from the sense aerial (after gain adjustment) but things are rarely ideal. Differences in

summed levels from each of the two aerials could lead to problems with amplitude nulling.

Additionally, I have no idea if any of these signals are emanating from different sites as this would cause further phasing complications to say nothing of the varying effects of multipath.

Then there is the fact that a frequency or phase modulated carrier will be quite different from one modulating data bit period to the next. During transition between bits, it is possible to have signals of a different phase or frequency on each aerial, particularly if there is significant spatial separation. This might be what Hugh alluded to at the top of page 45 but I'm not sure. If it is, sorry for the repetition.

This letter is no criticism of Hugh and Barrie's efforts, just some thoughts arising out of a couple of hours with an analyzer and a meter. They picked a tough nut to crack but their perseverance is to be commended without question. The final fine tuning of the system will probably be more of a challenge than the work so far but I am sure the system as it stands will help plenty of people who suffer with significant but not overwhelming interference. Well done, guys. I wish you well with the remainder of the project.

Sam Elsdon

ERRATA

RIG 46 page 56. In Trevor Day's article entitled *2M Interference Reduction System*, the value of R7 was inadvertently omitted from the components list. Its value is 2k2 but, as it appeared on the circuit diagram, its omission, hopefully, did cause any inconvenience. Ed.

The URL for RIG's World Wide Web site was incorrect in RIG 46. As only three or four members queried this, most probably realised that '.uk' was needed after 'org'. http://www.rig.org.uk/index.html is the correct URL.

LATE NEWS

HETE/SAC-B launch (see page 52).

Launch occured at 1709UT on 4 November and the Pegasus launch vehicle achieved the desired orbit but the payloads failed to separate from the rocket. As HETE's solar cells could not be deployed, its planned transmissions on 137.963MHz will not be heard.

ORBITING UPDATE

ALL THE LATEST NEWS

POLAR ORBITING SATELLITES

Some members are puzzled as to why NOAA is still issuing TBUS prediction messages for NOAA 9 long after the Advanced Very High Resolution Radiometer (AVHRR) imager failed (on 3 August 1995). Although the spacecraft has some power problems, several sub-systems are still operational. The Earth Radiation Budget Experiment (ERBE), the Solar Backscatter Ultra-Violet radiometer (SBUV) and the Search and Rescue system (SARP) constitute the main mission at present and the High resolution Infra-Red Sounder (HIRS) is also in a working condition.

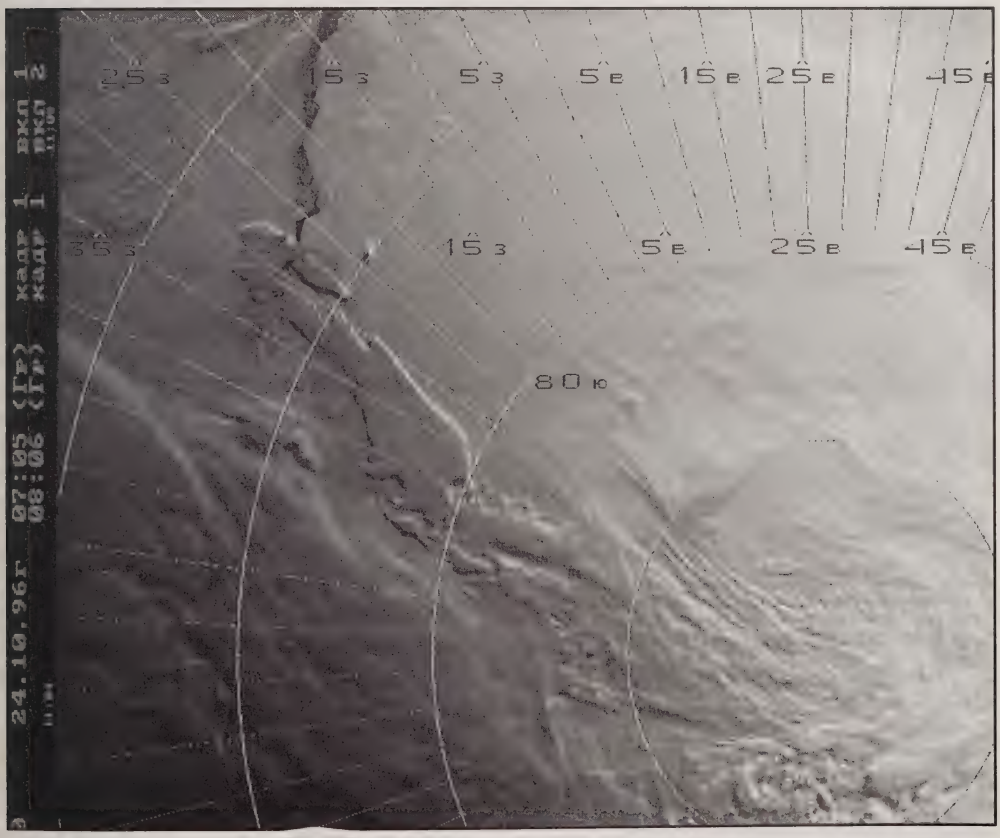
NOAA 10, although officially de-activated on 22 March 1995, is still imaging as many members with HRPT facilities will know. It has potential attitude control problems as there is now no gyro redundancy. Infrared imagery is virtually useless but visible imagery is usable despite scan motor jitters due to bearing lubrication problems. As

"Test card" shows that GOMS is capable of transmitting at good resolution.

well as the AVHRR, the Microwave Sounding Unit (MSU), the Data Collection System (DCS), the Space Environment Monitor (SEM), HIRS and SARP are all still capable of operating.

NOAA 11 has attitude problems following the failure of roll and pitch gyros and the AVHRR failed on 13 September 1994. However, the MSU, HIRS, SARP, SBUV and the Stratospheric Sounding Unit (SSU) are all operational.

NOAA 12 is the operational northbound evening spacecraft and is functioning well. High jitter on the scanner motor is being kept to acceptable levels by thermal control. When launched more than 5 years ago, the evening passes crossed the equator at 1930 local time and over the following two years this time got several minutes later. Now it crosses the equator at 1843 and is getting earlier by about 1.7 minutes every month. The inclination of the orbit has decreased from 98.73 degrees at launch to 98.54 degrees now and the precession of the orbit (which depends on inclination)



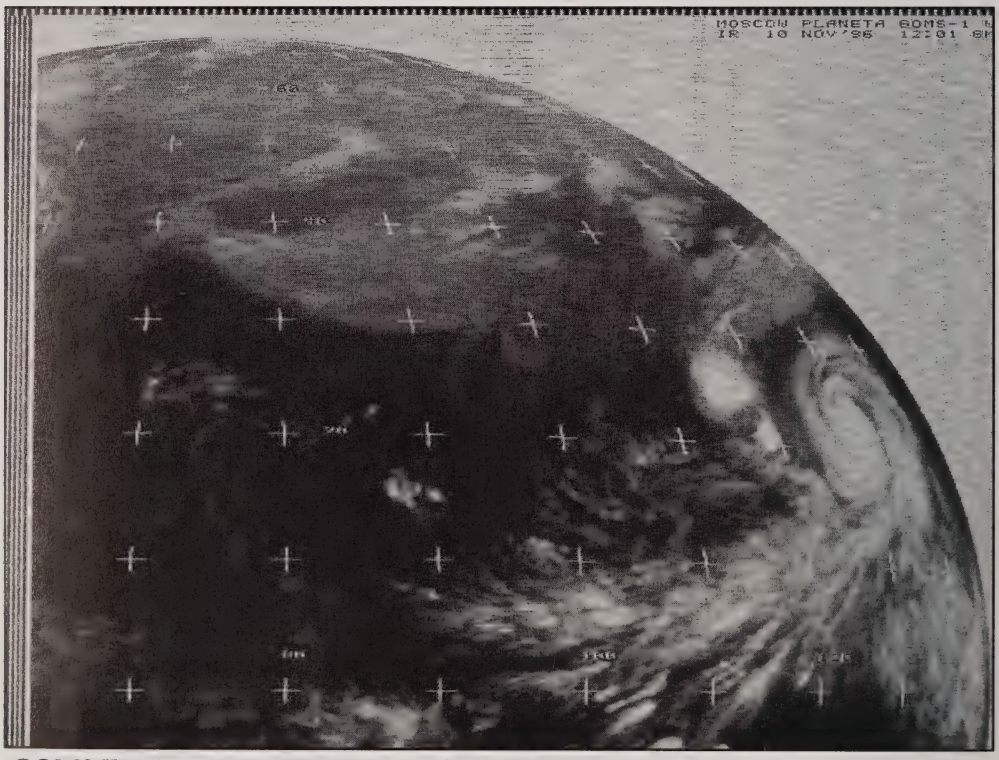
Meteor 2-20 image relayed by GOMS.

is insufficient to maintain true sun-synchronism. The earlier transit times mean that in winter in the northern hemisphere, both morning and evening passes have insufficient illumination for visible imagery.

NOAA 14 is the operational afternoon northbound craft and all systems are working except the SARP which failed on 6 February 1995. Two tape recorders have also failed. It has a potentially serious problem in that command redundancy was lost on 27 October 1995 when the backup command receiver demodulator failed. The local time of equator crossings of NOAA 14 are getting later by 1.4 minutes a month so winter images from this craft now also exhibit a lower level of illumination than in previous years.

NOAA 15 is to be launched by a Titan 2 vehicle from Vandenberg AFB, California, in April 1997.

METEOR 2-20 was presumed dead as no APT has been heard from it for several years but during September when neither Meteor 2-21 nor Meteor 3-5 were transiting



GOMS IR image 1201 UT 10 November 1996.

north temperate latitudes in daylight, Chris van Lint reported from Hong Kong that GOMS was relaying imagery from Meteor 2-20. Not only does it still have imaging capability but from the areas imaged it is clear that on-board recorders are also still functioning.

METEOR 2-21 was on for a time in late August and early September when Meteor 3-5's ground track was under-illuminated at north temperate latitudes. However, Meteor 2-21 was unable to fill the whole period when Meteor 3-5 was absent because it too ran out of daylight. Although the orbital inclinations of the two satellites are within .01 degree, the lower height of Meteor 2-21 causes it to precess faster and the orbital planes are now only about 12 degrees apart. This difference is decreasing and the orbits will be co-planar in early April 1997.

OKEAN 4 (or 1-7) developed difficulties in late August. Alex Ivanov reported power unit problems. A week later Alex reported that it was working only in the high resolution mode with a downlink on 465MHz but it did transmit a stored image over Europe on 137.40MHz on 3 August and a further transmission was logged in the USA on 9 October.

SICH 1's radar died in early November Alex reported. It is not yet clear whether other imaging modes will continue to be transmitted but Peter Wakelin has heard no transmissions since the radar failure. Sich and Okean 4 have provided many interesting images and these two identical craft lasted far longer than any of their predecessors. Predictions for Sich continue in the centre pages in the hope of transmissions resuming. Late addition - 11 November: Alex reports today that Sich's radar has been recovered.

GEOSTATIONARY SATELLITES

METEOSAT 5 was decontaminated between 0730UT 21 October and 0730UT on 25 October. During this period images were taken by Meteosat 6 at 10 degrees west longitude and disseminated by Meteosat 5 so that no antenna repointing was required. The images were rectified to the nominal position of zero degrees longitude. Following decontamination, the electronic gain settings were reduced from 8 to 7 for the water-vapour channel and from 7 to 5 for the thermal infrared channel. The orbital inclination is now 0.784 degrees and increasing and with only 7.3kg of propellant remaining, the nominal E-W station keeping and attitude control will be possible only until Spring 1997.

METEOSAT 6 remains the operational standby spacecraft located close to 10W and, during the decontamination of Meteosat 5, provided operational image data to users for the first time. There is sufficient propellant remaining to allow nominal orbit

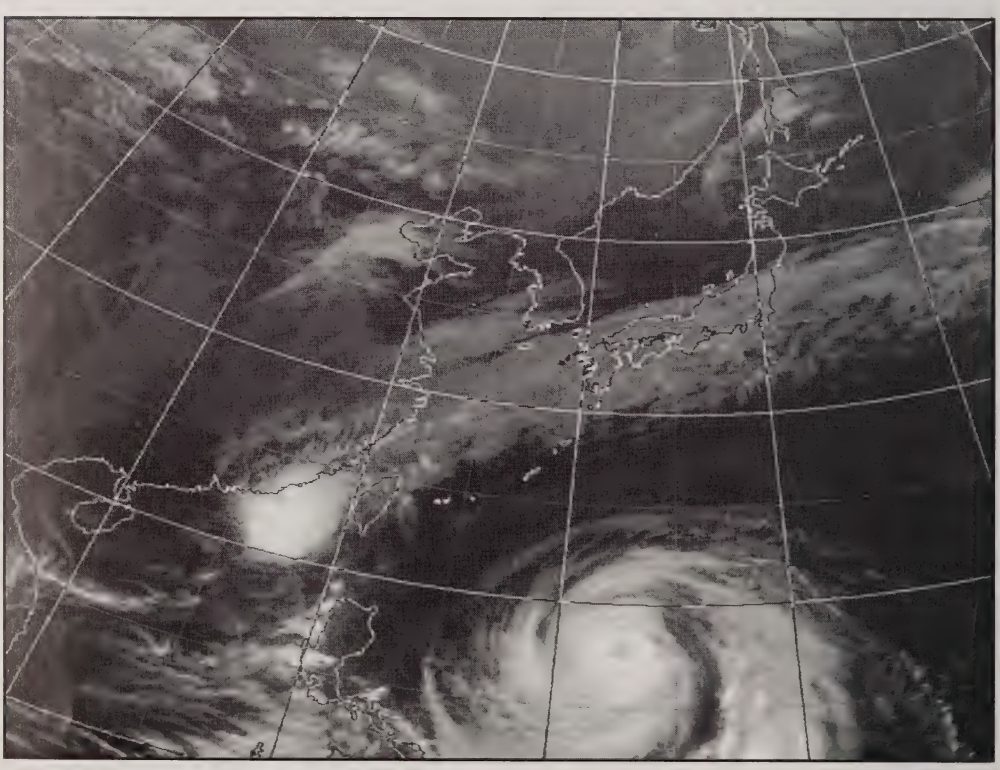
and attitude control for more than four years. Some additional fine tuning op the on-ground correction software to overcome the radiometric anomaly of the WV and IR channels is required to make this spacecraft fully operational.

METEOSAT 7 (or MTP-1) is the next of the current series and validation tests are continuing in anticipation of a launch in July 1997.

Agreements are in place for EUMETSAT to realay GOMS imagery through Meteosat when it becomes available. Up to eight images a day can be accommodated but relays cannot start before the end of the year.

Information on EUMETSAT's operations can be found on the Internet at: http://www.eumetsat.de and the existing information service on EUMETSAT's electronic bulletin board will cease at the end of 1996.

GOES 8 at 75W operates well but has some attitude control problems due to electrostatic discharge events.



GMS-5 IR image 1200 UT 10 November 1996.

GOES 9 monitors the eastern Pacific region from 135W and operates nominally with only minor problems.

GOMS remains an enigma. Earlier this year the Russians informed the World Meteorological Organisaion that GOMS was almost operational and issued a transmission schedule for 1691MHz. The transmissions from GOMS monitored in Hong Kong by Chris van Lint did not follow the schedule. He reported only a few retransmissions of other satellite's imagery. At the Meteorological Satellite Users' Conference held in Vienna in September, a representative from RPA Planeta, Moscow said that problems with GOMS had been overcome and GOMS images would be transmitted "from next week". A revised transmission schedule, dated September, was sent to WMO. At the time of writing, near real-time imagery from GOMS' own sensors remain elusive.

Chris has automated reception of GOMS transmissions on 1691MHz and, after analysing a week's output, sent the following observations on 3 November. There is no real schedule for WEFAX dissemination. The most consistent transmissions start at 1615UT and finish at 1730. There used to be some transmissions between 0325 and 0525 but they have ceased. Currently, these transmissions comprise Meteor 2-20 images but there have been retransmissions of Meteor 3-5 images in the past. Retransmissions of Meteosat and GMS images have ceased, presumably because the quality was so terrible. There are no transmissions of GOMS-generated images except for a rare test transmission around 1200-1300. The images originated from GOMS but were of such low quality it was impossible to tell if they were recent images. One day last week there was a transmission at 0430 when two good quality images from Meteor 3-5 were transmitted. They showed Alaska, the west coast of Canada, Great Bear Lake, Victoria Island and the Great Lakes. Chris added that there seems to be no fixed schedule outside of the two-hour WEFAX slot. Sometimes the satellite appears dead for a day or two and sometimes transmissions continue for about 30 hours or so. He cannot determine what these transmissions consist of but he has doubts about any imagery being available from GOMS itself. Chris sent the 'test card' image of the satellite data acquisition vehicle which shows that the GOMS system is capable of transmitting at good resolution.

Late addition - 11 November: Chris e-mailed this GOMS infrared image which is timed at 1201UT 10 November. He also sent a GMS-5 image taken at around the same time which confirms the similarity. The latitude of typhoon Dale east of the Philippines differs in the two images as the grid on the GOMS image appears to be inaccurate judging by the apparent position of the Himalaya Mountains.

Acknowledgements: I am grateful to numerous NOAA/NESDIS staff, Volker Gaertner (EUMETSAT), Gordon Bridge (EUMETSAT), Alex Ivanov (SCAN, Moscow) and Chris van Lint for their help in compiling this report. ⊕

KEPLER ELEMENTS

NOAA 10
1 16969U 86073A 96316.86304742 .00000038 8457
2 16969 98.5313 309.7576 0012235 286.8908 073.0929 14.25009335527638

NOAA 12
1 21263U 91032A 96316.76401261 .00000081 1533
2 21263 98.5504 331.5951 0012014 202.8436 157.2210 14.22668167285441

NOAA 14
1 23455U 94089A 96316.85773581 .00000055 8161
2 23455 98.9605 261.9961 0008959 179.6860 180.4317 14.11623876096288

METEOR 2-21
1 22782U 93055A 96316.85695115 .00000048 5235
2 22782 82.5481 230.0977 0021426 287.7314 072.1506 13.83063020161540

METEOR 3-5
1 21655U 91056A 96315.84701643 .00000051 9313
2 21655 82.5543 216.8715 0012400 158.5098 201.6546 13.16849453251973

OKEAN 1-7
1 23317U 94066A 96313.89623905 .00000097 1963
2 23317 82.5412 285.8926 0026202 334.0940 025.8957 14.74052561111852

SICH 1
1 23657U 95046A 96313.36707093 .00000051 1218
2 23657 82.5315 067.8481 0026969 304.4226 055.4436 14.73503711064061

Frequencies: NOAA 14 137.62MHz, NOAAs 10/12 137.50MHz
METEORs 137.30, 137.40 or 137.85MHz
OKEAN 4, SICH 1 137.40MHz

Explanation of elements format above:

Line 1: NORAD catalogue number, International designation, Epoch, Decay rate (NDOT/2), Bulletin number (thousands omitted), Checksum (1 digit).

Line 2: NORAD catalogue number, Inclination, Right Ascension, Eccentricity (decimal point omitted), Argument of perigee, Mean Anomaly, Mean motion (8 decimal places), Rev. number, Checksum (1 digit). ⊕

RIG GIF LIBRARY

PETER WAKELIN

I have made up two more disks this time. Disk 152 contains four good HRPT images from Dr Martin van Duinen in Holland. The theme of his images is mainly rivers. Some show rivers as brilliant, white, meandering lines caused by sunglint and other infrared images show the relatively warm water as black compared with cold, winter land. Part of one of these images appears overleaf.

Chris van Lint reports from Hong Kong that GOMS is not generating any imagery but is relaying images from other spacecraft. The relays of GMS and Meteosat images are very poor but those from Meteor 3-5 and Meteor 2-20 are good. Five of his images from these two Russian Meteors are on disk 153 and cover both polar regions and southern, northern and eastern Africa.

With high-speed modems commonly available and telephone charges continuing to fall, the entire GIF image library has been put on the RIG BBS. Individual images are not available but the contents of each disk has been PKZIPped into a single file. As compression of GIF files is minimal, each .ZIP file is close to 1.4Mb. The files are logically numbered so if you want the images on disk 152 then download the file GIF152.ZIP.

The full list of available disks appeared in the March journal. The additions since then are as follows:

148	GOES9/HRPT from Australia (7 images)	Jim Whittaker
149	HRPT R. Nile, Cyprus, Azores (4)	Ferruccio Paglia
150	HRPT R. Volga, Egypt, Iraq (3)	Ferruccio Paglia
151	Azores, Canaries and Cyprus (3)	Ferruccio Paglia
152	Rivers of northern Europe. HRPT (4)	Martin van Duinen
153	GOMS relays Meteor images (5)	Chris van Lint

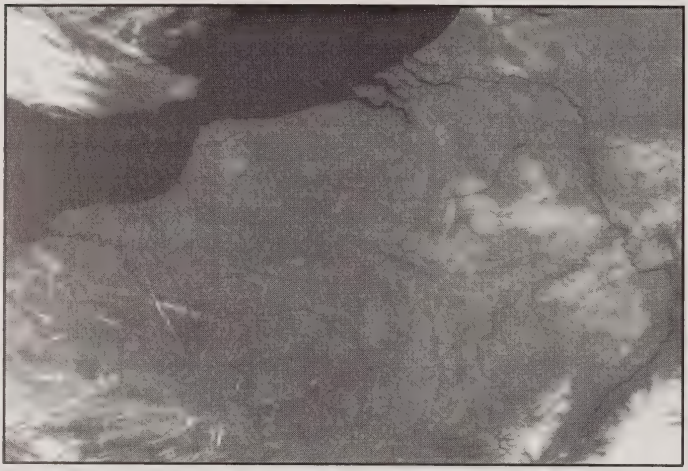
HERE'S HOW TO OBTAIN DISKS

The cost is £2 for the first disk plus one pound for each additional disk with no limit to the number ordered. RIG provides disks, packaging and postage. For small orders, UK members may prefer to send postage stamps rather than write cheques for small amounts.

UK members: Cheque or postal order made payable to Remote Imaging Group and

sent to Peter Wakelin, 1 Charters Road, ASCOT, Berkshire, SL5 9QF. There is no credit card service for members in the UK.

Other members: Bank draft (in Sterling and drawn on a London-based bank) or Eurocheque made payable to Remote Imaging Group and sent to Peter Wakelin at the address above. Overseas members may prefer to pay by credit card (subject to a 3% surcharge). Credit card orders should also be sent to Peter Wakelin either by post or fax (+44 1344 26028). ⊕



Rivers Seine, Rhine and tributaries.

WORLD WEATHER HIGHLIGHTS
August-October 1996

The unusually cold weather of July in southern Africa reported last time continued into August with sub-zero temperatures as far north as the Tropic of Capricorn in Botswana. -15C was recorded in the highlands of Lesotho.

Large parts of Australia experienced unusually heavy late winter rainfall in August. Parts of Western Australia, Victoria and South Australia had almost three times the normal rainfall.

Violent storms in the northeastern USA during late October resulted in over 200mm of rain in one day in Portland, Maine and some places in the south of the state recorded almost 500mm in 36 hours.

As reported last time, Typhoons Herb and Gloria affected Luzon Island in the Philippines at the end of July. Some rainfall figures are now available: Baguio, in northern Luzon, recorded 1384mm in the space of 6 days from the two typhoons! That's two years' rainfall for London! ⊕

RIG HELPLINES

General enquiries Meteosat information, NOAA information, Complaints about RIG-supplied equipment.	John Tellick	0181 390 3315

A copy of the Group's rules can also be obtained from John Tellick

Russian and Chinese satellite information	Peter Wakelin	01344 23200
HRPT	Peter Wakelin	01344 23200
PDUS	James Brown	01656 782632 *(not available on Sundays)*
Antennas and computing	John Boyer	01293 776862 *(7.00pm-9.00pm not Tuesdays or Wednesdays)*
Schools/educational co-ordinator	John Tellick	0181 390 3315

Schools/educational enquiries	John Murray	Torquay	01803 386252
	Frank Bell	Godalming	01483 416897
	Tom Walter	Reading	0118 9871330
	Bob Coombes	Haslemere	01428 642930
	John Din	Bristol	01454 773387
	Alan Wright	Norwich	01603 713449
	Rob Bales	Merseyside	0151 3439300

Microcomputer specialists:

Commodore Amiga	Chris Pretty	01420 82752
Archimedes	Tom Walter	0118 9871330

NOTE: We are grateful to the above members for offering their services to the Helpline. Please do not abuse the service by ringing them for queries other than those listed against their names.

Most of the helpline numbers listed under Schools/educational enquiries are situated in the south of England. John Tellick (address on page 2) would be pleased to hear from members in the educational field in other areas who would be willing to give help and advice. ⊕

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If you would like to join RIG and receive this Journal, complete this form (or copy) and send it to:-

RIG-SUB, PO Box 142, RICKMANSWORTH, Herts, WD3 4RQ, England.

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If you would like to have back issues see 'Shop Corner'.

TOTAL AMOUNT:£ _____ Cheques payable to 'RIG' (no foreign currency please)

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Signature _____

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Are you willing to have your name/address made known to other members?
YES/NO (Delete as applicable)

Are you receiving :-
Polar orbiting weather satellites _____ Geostationary weather satellites _____

DECLARATION: I do NOT object to the Remote Imaging Group holding my membership details on a computer.

Signed _____ Date _____

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IN THE EVENT OF PROBLEMS WITH EQUIPMENT PURCHASED FROM RIG PLEASE CONTACT RIG IN THE FIRST INSTANCE AND NOT THE MANUFACTURER.

All prices shown include post and packing except where marked

Receiving / Decoding Equipment	**UK/EC Price**	**Overseas Price**
RIG*sat*-RX1 two-channel 137MHz self-build receiver.		
PCB, crystal IF filter and FETs	No longer available	
PCB and FETs only	No longer available	
RIG *sat*-RX1A 5-channel upgrade PCB	£4.00	£4.00
RIG *sat*-IF1	£4.50	£5.00
RIG DARTCOM Meteosat Downconverter. Assembled and tested module in tin plate box	£155.00	£132.00
Complete, assembled and mounted in weather-proof box.	£190.00	£162.00
RIG DARTCOM VHF Scanning Receiver. Assembled and tested module with LED channel number display.	£135.00	£115.00
As above but with LCD frequency read-out instead of LED channel number display. *Both the above items are modules and require a box, together with several components, switches, etc.*	£179.00	£152.00
RIG VHF Preamp. Includes a bandpass filter and is ideal for mast-head mounting. Assembled/tested module; needs boxing.	£18.00	£16.00
RIG 1695MHz Low Noise Amplifier kit. *Experienced constructors only.*	£29.00	£25.00
Martelec JVFAX Interface Unit	£78.00	£70.00

Connecting lead £5 extra (specify whether 25 or 9-pin required)

Antenna systems	UK Price
RIG CROSSED DIPOLES A Turnstile type design, in kit form	£26.00
RIG/TH2 47-element YCV loop Yagi (1.7GHz)	£85.00
JAYBEAM 5X-Y 2m 5 element crossed Yagi, in kit form	£55.00

DISHES, FEEDS and BACKING PLATES not available by mail order. Contact Henry Neale. Tel:01945 440353

Crossed dipoles and the YCV loop Yagi can be dispatched overseas. Postage extra. Details on request from Peter Wakelin.

RIG Binders

UK Price £4.00 each, EC/European Price £4.50, Outside Europe Price £5.00.

CD-ROMS	UK Price	EC Price	Other Price
Meteosat No. 3, Europe's Four Seasons (2 disks)	£12.50	£13.50	£15.00

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		UK Price	EC/Europe Price	Outside Europe Price
RIG 8-11	1987	£5.00	£6.00	£7.00
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RIG 16-19	1989	£5.00	£6.00	£7.00
RIG 20-23	1990	£6.00	£7.00	£8.00
RIG 24-27	1991	£6.00	£7.00	£8.00
RIG 28-31	1992	£6.00	£7.00	£8.00
RIG 32-35	1993	£6.00	£7.00	£8.00
RIG 36-39	1994	£6.00	£7.00	£8.00
RIG 40-43	1995	£6.00	£7.00	£8.00
RIG 44-47	1996	£6.00	£7.00	£8.00

Note: Prices quoted are for a set of four, including Post and Packing.

RIG 1-7 are currently out of print. Owing to depletion of some issues, photocopies may be supplied. Individual issues are no longer available (hardship cases excepted).

Ordering Information

All items are available from the Editor, Peter Wakelin (address on page 2) and include return by UK 1st class mail (except antennas and Journals). Items to non-UK addresses sent via airmail.

UK VAT is now applicable on sales to the following EC countries - France, Germany, Belgium, Portugal, Spain, Republic of Ireland, Austria, Sweden, Denmark, Italy, Luxembourg, Netherlands, United Kingdom (including Isle of Man). Members in these countries should use UK/EC price when ordering. EC members who are registered for VAT must forward their VAT registration No. to the Treasurer to enable them to receive VAT exempt goods.

As UK/EC prices now include VAT where applicable; receipts will be issued upon request. Remote Imaging Group VAT Registration No. 594 7483 83. Channel Isles: divide by 1.175 to remove VAT content.

UK members, By Cheque or Postal Order.

Overseas members, Pay by Bank Draft (drawn on a UK London-based bank) or Eurocheque(s). (Payments to a Maximum of £100.00 in any one Eurocheque). No local currency please.

All cheques made payable to "REMOTE IMAGING GROUP".

Credit Cards Accepted (Access/Visa/Mastercard/Eurocard) Add 3% to Total. Available by MAIL ORDER from Peter Wakelin (address on page 2) or FAX 01344 26028 (International +44 1344 26028). Card-holder's signature required. NO TELEPHONE ORDERS.

Please state type of card, Card No., Expiry Date.
All Credit Cards authorised before goods are despatched.
(Note: Ordering by Credit Card does not mean instant despatch!)

RIG AT RALLIES

Subject to volunteers being forthcoming, RIG will be at the following rallies in the early part of 1997:

VHF Convention, Sandown Park,	16 February 1997
Pickett's Lock	8 and 9 March 1997

SUBMISSION OF ITEMS FOR PUBLICATION AND COPY DEADLINES

Please send contributions, which should be original, to the Editor. Although typed and hand-written items are quite acceptable we would prefer longer pieces to be on a PC disk in one of the popular word-processing formats, ideally in Word Perfect. Drawings and diagrams may be submitted on disk, preferably in a Windows Meta File compatible format, but please send hard copy also. Diagrams and images must be in separate files and should not be embedded in documents. To reproduce well, satellite images must have a good range of tones. Contact the Editor for further information.

COPY DEADLINE FOR THE MARCH ISSUE: 25 JANUARY 1997

RIG ON LINE

Bulletin board: Tel 01344 874140

World Wide Web: http://www.rig.org.uk/index.html

Packet: G4TRE@GB7EIP - "WXSAT@GBR"

The BBS contains recent orbital elements, news likely to be of interest to members, the current satellite transmitting status, relevant software, some images and also members' 'For Sale' and 'Wanted' notices.

The WWW pages, which are still under development, contain images, status reports and information about remote sensing and RIG.

OTHER BULLETIN BOARDS

Timestep BBS:	Tel 01440 820002
Dartcom BBS:	Tel 01822 880249
Henry Neale BBS:	Tel 01945 440666

All the above bulletin boards use 8 bit, no parity, 1 stop bit.

LATE NEWS:

Icelandic Volcano (see page 49). The expected floodwater broke free from under the ice on 4 November and the island's ring road was destroyed in several places. A further major eruption took place on 6 November.

DESCRIPTION OF COVER IMAGES

Front Cover

This NOAA 12 image, courtesy NOAA/NESDIS, is timed at 1215UT on 18 October 1996. The early morning sun is shining on hurricane Lili over Cuba where great detail shows in the northwest quadrant. This multispectral image was made using channel 1 as the red component, channel 2 as green and the thermal infrared channel 4 as blue.

Inside Front Cover

Part of the coast of County Kerry in southwest Ireland is shown in this spaceborne radar image. The delicate patterns in the water are caused by refraction of the Atlantic swell waves around the peninsula edges and islands. They are particularly prominent around Skellig Rock near the left edge and around Scariff Island towards the bottom of the image. This image was acquired by the Spaceborne Imaging Radar-C/X-band Synthetic Aperture Radar (SIR-C/X-SAR) onboard the Space Shuttle Endeavour on 12 April 1994. The colours are assigned to different radar frequencies and polarizations of the radar as follows: red is L-band (24cm) horizontally transmitted and received; green is L-band vertically transmitted and received; and blue is C-band (6cm) vertically transmitted and received. SIR-C/X-SAR, a joint mission of the German, Italian and United States space agencies, is part of NASA's Mission to Planet Earth programme. Image courtesy JPL, NASA.

Inside Back Cover

This fine image from Chris van Lint was acquired from NOAA 11 at about 0500UT on 27 April 1992 when he was in Korea. It has been artificially coloured using Hartmut Zaun's Colorize programme.

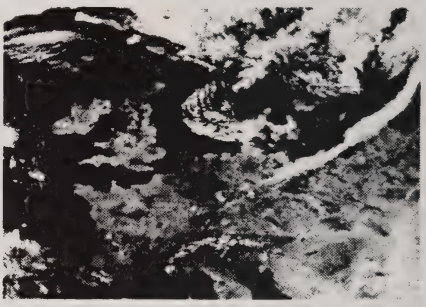
Back Cover

Top: This photograph shows two of the huge depressions which formed on an Icelandic glacier when ice beneath was melted by the volcanic eruption. Each depression is about 2km across and 100m deep. Photo copyright Isleifur Ottessen, Leiguflug, Reykjavik, Iceland. See *Volcanic Eruption in Iceland* in this issue for more details.

Bottom: This image is derived from data obtained from ADEOS TOMS and shows the low levels of ozone measured over Antarctica in September. See *1996 Antarctic Ozone Hole* in this issue for more details.

TH2 Imaging

34 Princes Gardens
Margate
Kent CT9 3AR
Tel : 0843 - 223831
Fax : 0843 - 862212



TH2SAT PC Weather Satellite Processing System Version 2.2

- Instantaneous control of input levels from keyboard while receiving
- Input levels automatically saved
- Large range of *simple to operate* image processing commands
- Very simple image pseudo-colouring facilities (including infra red)
- High definition images obtained due to high 4800 hertz sampling rate
- Colour animation included as standard
- Fully working demonstration program available for £3.50

Price £100 + postage (RIG members)

A quarterly publication for hardware, software and applications of WEFAX, APT, VAS, HRPT and GOESTAP.

WeatherSat Ink

The Environmental Satellite Applications Journal

4821 Jessie Drive, Apex, NC 27502, USA

$18 US per year $23 (surface) or $33 (airmail) overseas, US funds

MasterCard / Visa OK

martelec communication systems

Antennas, Receivers, Downconverters, Software, Systems

MSR50 Virtual Satellite Receiver

A new and really exciting way to receive weather satellites. The MSR50 is a very high performance, synthesised receiver, totally controlled from your PC (IBM compatible or Amiga), providing unrivalled performance and features at a very modest price. See RIG43 article for details. The MSR50 is supplied complete with software (either PC or Amiga), and cable.

£179.00

MSC30 2-Channel Downconverter

Our policy of continual development ensures that the MSC30 Downconverter remains the finest you can own. Features include very low noise figure, high gain, buffered output for driving long cables, and good temperature stability. The MSC30 is housed in a professional sealed diecast box, and can be powered either via the coaxial feed, or by a conventional 3-wire system. High-quality N-type input, BNC output. Comes complete with 1.25m N-type/N-type cable, all connectors, and even silicon weather-proofing tape! **£220.00**

MSC50 Single-Channel Downconverter

Same high performance and outward appearance as the MSC30, but having only one oscillator, to reduce the cost for those wishing to receive Meteosat A1, GOES, & GMS (converts 1691MHz to 137.5MHz). Of course, MSR50 owners can still receive Meteosat A2 by tuning to 141MHz! **£190.00**

MSF30 1.7GHz Dipole Feed

A precision machined dipole feed suitable for Meteosat/GOES/GMS dishes with an f/d = 0.35 - 0.42. Features adjustable focus and polarization. N-type output socket. **£56.00**

MSH20 Professional 137MHz Crossed Dipole

A very rugged, well made turnstile. Comes with stainless-steel fastenings, and 20m terminated feed cable. **£59.50**

MSA20 137MHz Crossed Dipole

Standard turnstile antenna. Comes complete with 20m terminated coaxial feed. **£49.50**

MSK30 VHF Preamplifier

A low noise 137MHz preamplifier in sealed diecast box. This new design offers low noise (typ. 1dB) & gain = 12dB. Other gains available to special order (+6dB to +28dB) **£25.00**

Also available without case as MSK30M **£19.00**

NEW! Latest Version of Amigasat Released

V4.0 is now out! Many new software features, plus a new Series 2 interface with throughport facility for printer etc. Upgrades available to existing users (£50 - £35). Complete V4.0 System **£199.00**

Series 2 Interface only **£59.00**

Ordering Information

Prices shown include VAT for the U.K. and EU countries. For all non-UK countries additional carriage will be charged at cost.

Payment may be made by cheque, postal order, or Visa/Access/Mastercharge cards.

The Acorns,Wyck Lane, East Worldham, Alton, GU34 3AW, England. Tel / Fax 01420 82752

Timestep Offer to RIG Members
PROsat II Capture Card

PROsat II has become the most widely respected and definitive Weather Satellite Capture program used by RIG members. It will operate in most contemporary PC's (286, 386, 486 etc with SVGA) and uses one internal slot. All software features are selected with user-friendly mouse-operated pull-down menus. False colour can be added to good quality visible light images. Capable of receiving and decoding all known analogue weather satellites, PROsat II sets new standards in Software and Hardware design. Image processing, full colour animation and 3D are just some of the many features currently included. New features are constantly being added. Now technical support is directly from Timestep. Timestep Weather satellite systems are used and recommended by Arthur C. Clarke, author of "2001 : A Space Odyssey" and inventor of the communications satellite.

Other software comes and goes, sometime the flavour of the month, sometimes forgotten. PROsat II just gets better and better ! When the new Okean 4 was switched on, it came as no surprise that PROsat II users merely clicked on OKEAN and achieved perfect results, first time.

Geostationary Satellites Meteosat, GOES and GMS are all geostationary satellites; they orbit at the same rate as the Earth and hence appear to be fixed in the sky. Images are therefore constantly available. The PROsat II system covers all known analogue geostationary satellites; images of the Earth's surface can be received as often as every 4 minutes. A small dish antenna is required together with some simple reliable hardware.

Polar Orbiting Satellites NOAA, Meteor, Okean and Feng Yun are polar orbiting satellites. They pass near to the poles about every 110 minutes. Each satellite passes over most countries twice a day at a different time each day. Their strength is such that a simple fixed antenna can be used. Direct readout of temperature along with latitude and longitude is an important feature of the software. Now land/sea and political boundaries can be superimposed on to the image and "nudged" if they are not quite perfectly aligned. All of the satellite data is stored; a full view of Infrared and Visible images are shown on the screen during reception.

Colour Animation Full screen, full colour animation is now standard. Up to 1,000 images can be automatically animated. The colour is realistic and computer processed (D2 section only) and even shows relative temperature by the shades of blue for the sea and green for the land. Clouds show up as white and shades of grey. Reception is completely automatic. Run the software and walk away; every time you pass, the computer will be showing the very latest sequence.

Geostationary Features
Images as often as every 4 minutes
Live display of incoming images in 64 grey scales
Auto schedule to save images
Pan and zoom to greater than pixel level
3D display
Median filter to remove country outlines
False colour with AutoSet
1,000 frame colour animation (option)
Transect between any two points
600 DPI, 300 DPI and dot matrix printing
Windows export
Annotation

Polar Features
Reception of all polar satellites
Live display of incoming image in 64 grey scales
Auto schedule to save images
Saves the complete pass in full resolution
Temperature readout with no calibration
Latitude and Longitude gridding
Country and State outlining
Distance and Bearing between any two points
Your location shown on image
600 DPI, 300 DPI and dot matrix printing
Windows export
Annotation

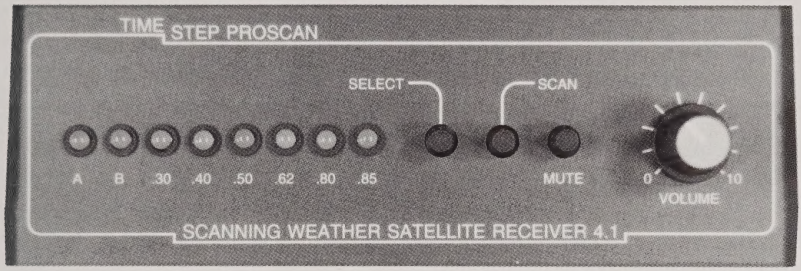
Track II The tracking program used by most serious satellite watchers. This is not public domain and was written by Peter Arnold our Cambridge Graduate. Up to 6 satellites can be shown on screen all at the same time. Actual locations, their footprints and their rise and fall times are always shown. To our knowledge, no other program provides these features.

PROsat II Colour Animate, Track II, All NOAA/Soviets, Temperature calibration & PC Card

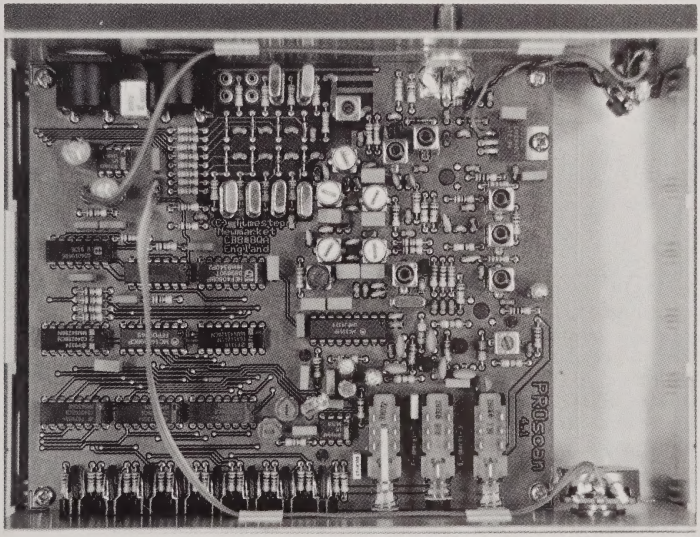
Timestep PO Box 2001 Newmarket CB8 8XB England
Tel. 01440 820040 Fax. 01440 820281

Timestep Offer to RIG Members

PROscan Polar Receiver



What do you want from a Scanning Weather Satellite Receiver ? a) Intelligent squelch that only responds to weather satellites and is quiet when no satellite is present b) To be able to read the frequency directly from the front panel when it stops on a satellite c) To be able to "lock out" unwanted satellites d) Resistant to pager interference up to the pager transmitter itself (where of course the field strength is low e) Resistant to pager interference at 1 to 2 miles where the field strength is at a maximum f) An unconditional 12 month money back guarantee g) Full technical support directly from Timestep **and** h) the ability to control the receiver frequency from the computer so that you are sure that **all** passes can be received in your absence.



The PROscan receiver uses a lot of filtering, 3 coils in the pre-amp (optional), 4 coils in the RF amp (total 7 coils at RF), 3 coils in the oscillator, 1 matching coil at first IF, 5 ceramic filters at first IF, 5 coils at second IF (total 11 IF filters) and a quadrature discriminator for linearity and high ultimate signal to noise. A preamplifier is not required for short cable runs but adds extra selectivity and makes up for feeder loss on longer runs.

Timestep PO Box 2001 Newmarket CB8 8XB England
Tel. 01440 820040 Fax. 01440 820281

Trade Talk

** Winter news to RIG Members from Timestep **

Rallies Exhibitions Leicester has come and gone now. This was the best yet and was their 25th anniversary. Unfortunately Granby Halls is going to be demolished in the next year so it will be in a different place next year. We will be at the VHF convention at Sandown Park on February 16 and at Pickets Lock on 8-9 March. We will always have stock and sometimes special prices.

Serial Systems A lot of RIG members are using note-book computers or their desk-top computer is already full of cards. We always have supplied serial interfaces that simply plug into a spare serial port. Just supply with 12V and plug it in. We have a PROsat for Windows version that for a little while we will sell to RIG members only at £299.00 inc. This unit is featured on the back of our Windows brochure. Also we have a genuine cancelled export order for PROsat II serial interfaces with a built in 2 channel (137.50 137.62MHz) NOAA receiver for just £199.00! Think about this, all you need is an antenna, a bit of co-ax and a computer. Nothing else, you even get TRACK II and Colour Animate. The software is identical to our best selling PROsat II.

RIG Offers Timestep offer RIG members very preferential pricing. The price exists for the duration of the magazine, therefore pricing quoted in Issue Number 46 has now expired and the pricing in this issue will expire when RIG 48 is printed. If you are asking us for prices, you must identify yourself as a RIG member. If you do not mention RIG every time you will be quoted the standard list price. All prices to RIG members are cash with order (no credit), we cannot supply items to anyone other than yourself. The prices are for cheques/drafts payable at a London Bank, MasterCard, Visa or Switch only. We cannot accept Euro Cheques or official orders at these prices. Quotations are not needed or available, the prices below are correct. Remember PROsat II has now gone down in price and includes Track II and Colour Animate !

New Developments PROsat for Windows now has full colour support for GOES 8 and GOES 9, every section every image. You now also get full GMS colour images. PROsat for Windows really does have superb resolution due to its high sample rate, but, more importantly the extensive filtering. If you have a DX2/4 or Pentium with 8MB then this is for you. It will even collect images and animate whilst minimised so that you can get on and do other tasks. Future upgrades are planned and you can be sure of a long lasting product.

Elements Our BBS can be accessed by anyone with a modem. You do not need to be on Internet or have any complications. Plug the modem into your computer and that's it. No subscriptions no fees and no hassle. It is mostly updated every week and never more than 14 days old. Elements and news files and satellite status reports are easily down-loaded so that you can update your software and print out the news to read at your leisure.
We can handle virtually any standard right up to 28,800. The number to call is 01440 820002.

RIG Members prices

APT
PROscan receiver £225.00
VHF 137MHz preamplifier £25.00
Assembled crossed dipole antenna £45.00
40M antenna cable £36.00

APT-WEFAX Software
PROsat II card/software £99.00
PROsat II/PROscan cable £15.00
PROsat for Windows card/software £249.00
PROsat windows PROscan cable £29.50

WEFAX
90cm dish, feed & bracket £180.00
P-HEMT Preamp £95.00 (with RX only)
20M signal cable £18.00
Meteosat 2 channel receiver £275.00

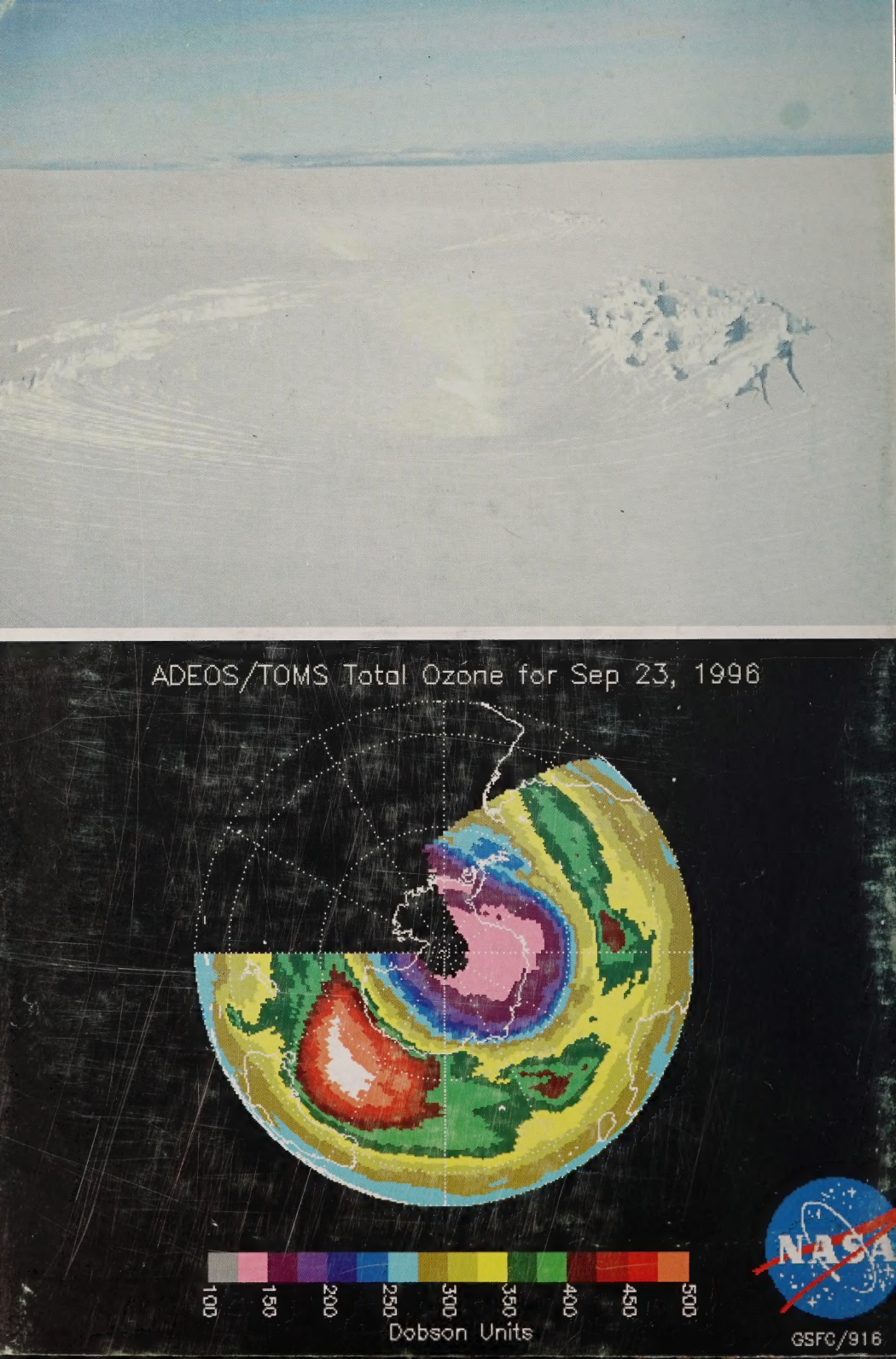
HRPT
HRPT dish/feed £190.00
P-HEMT Preamplifier £95.00 (with RX only)
20M signal cable £18.00
Yaesu R5400 Az-El rotator £525.00
20M rotator cables (must be ordered with rotator) £95.00
Autotrack computer/dish controller £190.00
6 channel HRPT receiver £550.00
HRPT analogue card/software £250.00

PDUS
1.8M dish & feed £550.00
P-HEMT Preamplifier £95.00 (with RX only)
20M signal cable £18.00
2 Channel PDUS receiver £550.00
PDUS PC data card £250.00
PDUS Key card (key extra) £150.00

Colour Catalogue, got yours yet, if not phone now !

VAT included. **Carriage** in the UK is £6.00 per order. Elsewhere by Fed Ex/UPS is £35.00 (if a dish and or R5400 is included the total carriage is £120.00).

Timestep PO Box 2001 Newmarket CB8 8XB
Tel. 01440 820040 Fax. 01440 820281


ADEOS/TOMS Total Ozone for Sep 23, 1996
100
150
200
250
300
350
400
450
500
Dobson Units
NASA
GSFC/916